HOW TO SERVICE

KODAK FLASH SUPERMATIC AND KODAMATIC SHUTTERS

Eastman Kodak Company • Rochester 4, N.Y.

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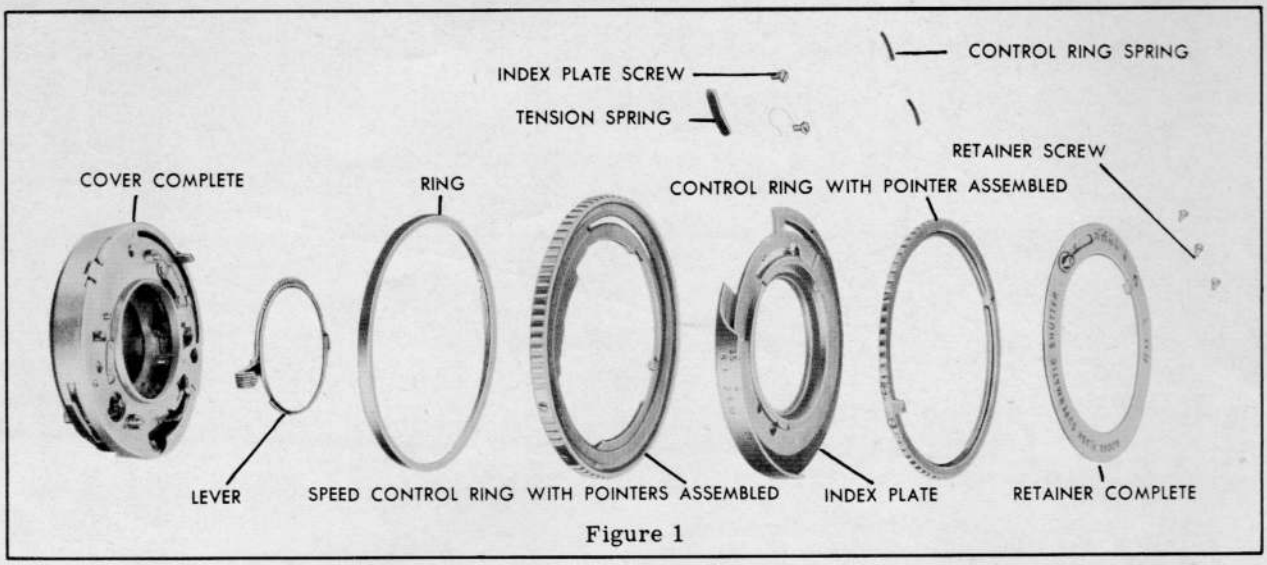
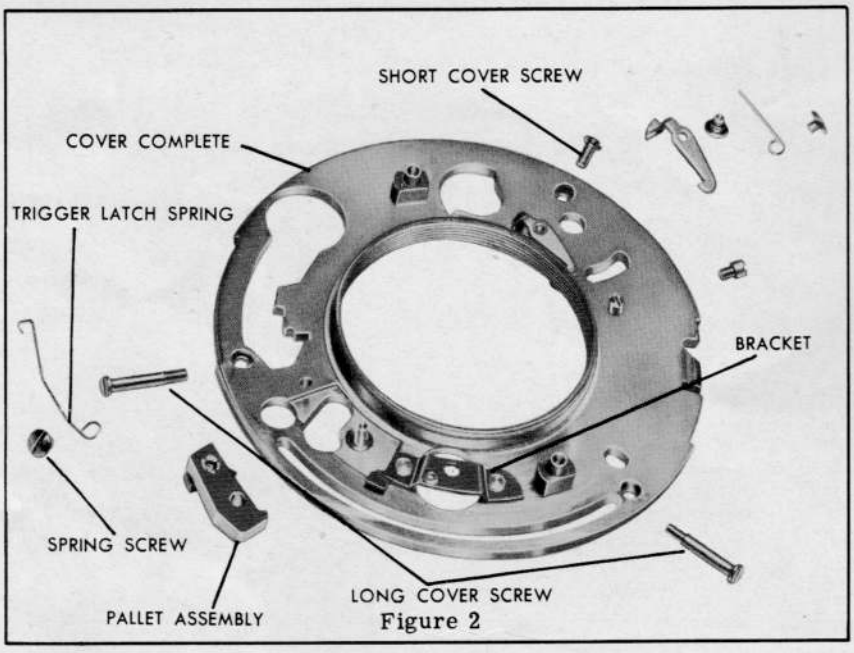


Figure 1



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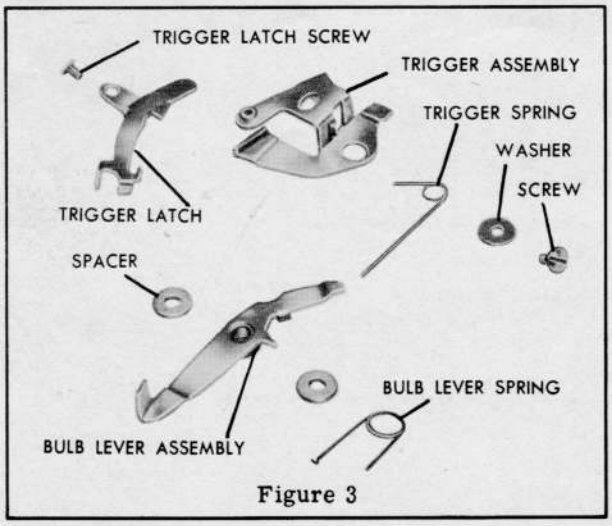

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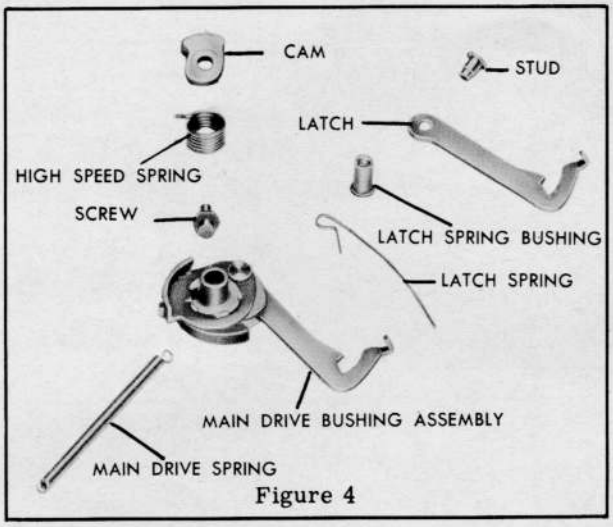


Figure 4

KODAK FLASH SUPERMATIC SHUTTER

FOR THE KODAK MEDALIST II CAMERA

DISASSEMBLY

PARTS ON FRONT OF SHUTTER

Place the shutter on the shutter protector block, tool No. 501-W, and remove the front lens element, using tool No. 501-0. Then remove the block.

CAUTION: Care should be taken not to damage the contact wire on the back of the shutter. If a minor repair is to be made, the contact wire need not be removed. If the shutter is to be completely disassembled, remove the wire by heating the solder which holds the wire to the CONNECTOR SCREW (Figure 7) or cut the case insulating bushing just below the CONNECTOR SCREW NUT.

Unscrew the rear lens element. Remove the three diaphragm control ring RETAINER SCREWS (Figure 1).

Lift up the diaphragm control ring RETAINER COMPLETE.

Lift off the diaphragm CONTROL RING WITH POINTER ASSEMBLED. Remove the two diaphragm CONTROL RING SPRINGS.

Remove the two speed INDEX PLATE SCREWS, and lift off the speed index plate and the speed control ring TENSION SPRING.

Lift off the SPEED CONTROL RING WITH POINTER ASSEMBLED.

CAUTION: If a minor repair is to be made and the shutter does not have to be completely disassembled below the COVER COMPLETE, care should be taken when removing the speed control ring with pointers assembled. If the winding LEVER is disturbed at this point the flash timing will have to be adjusted.

Remove the shutter retaining RING. Lift off the winding lever.

COVER COMPLETE AND ASSOCIATED PARTS

Remove the TRIGGER LATCH SPRING (Figure 2) by removing the trigger latch SPRING SCREW.

Remove the TRIGGER LATCH SCREW (Figure 3) and lift off the TRIGGER LATCH.

Lift off the high speed spring CAM (Figure 4) and the HIGH SPEED SPRING. Remove the flash retard PALLET ASSEMBLY (Figure 2).

Remove the SHORT COVER SCREW and the two LONG COVER SCREWS. Then lift off the cover complete.

PARTS ON MECHANISM PLATE COMPLETE

Lift out the WINDING GEAR with pinion and spring assembly (Figure 5).

Remove the retarding SECTOR SCREW (Figure 6). Next set the shutter and lift out the retarding SECTOR WITH STUD and the retarding SECTOR SPRING. Then remove the main drive SCREW (Figure 4).

Trip the shutter and unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD (Figure 12). Unhook the blade controller LATCH SPRING (Figure 4) from the blade controller LATCH. Set the shutter and at the same time move the end of the blade controller latch toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY together with the main drive spring.

Open the shutter blades by pushing the BLADE CONTROLLER (Figure 12). Then open the diaphragm wings.

Remove the trigger SCREW (Figure 3), the TRIGGER SPRING, and the trigger WASHER.

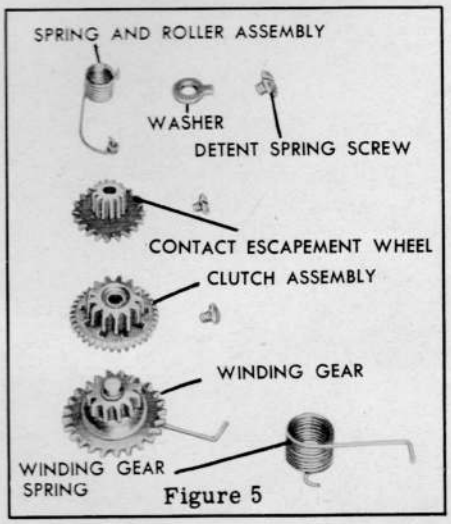
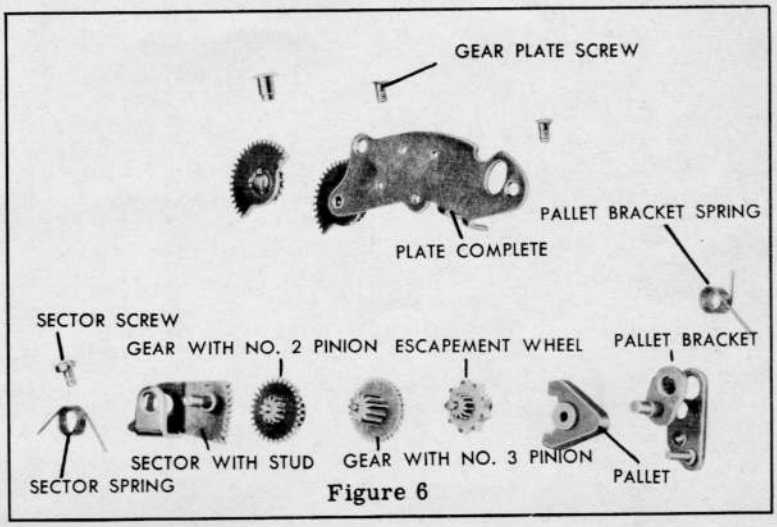


Figure 5



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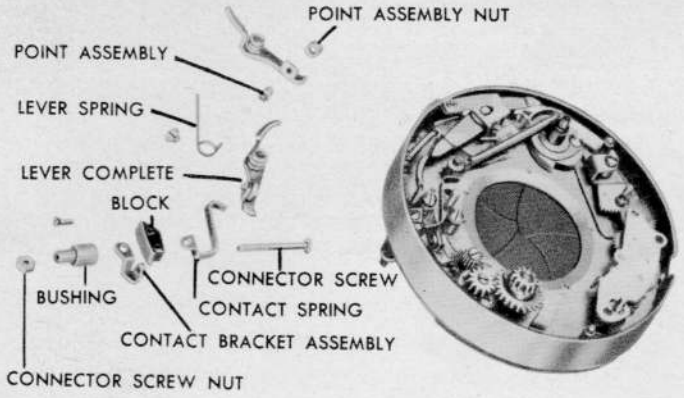
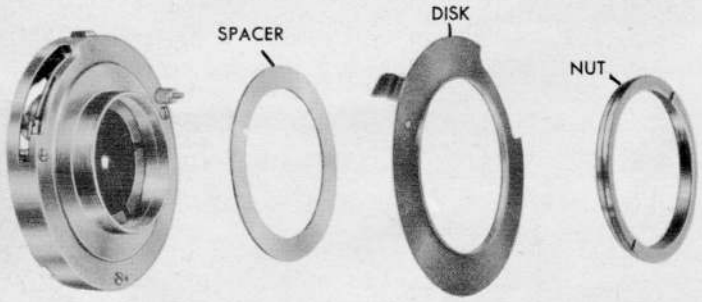


Figure 7



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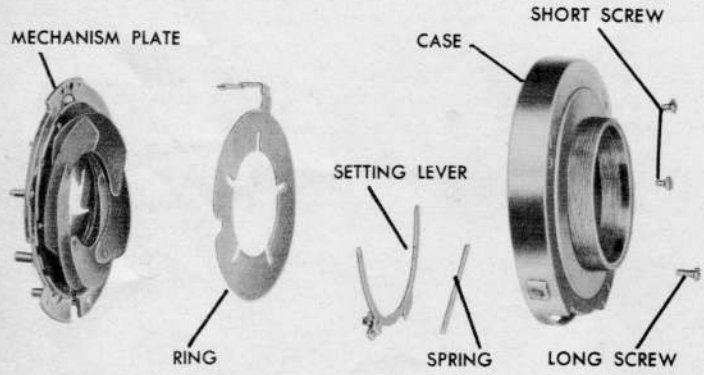


Figure 9

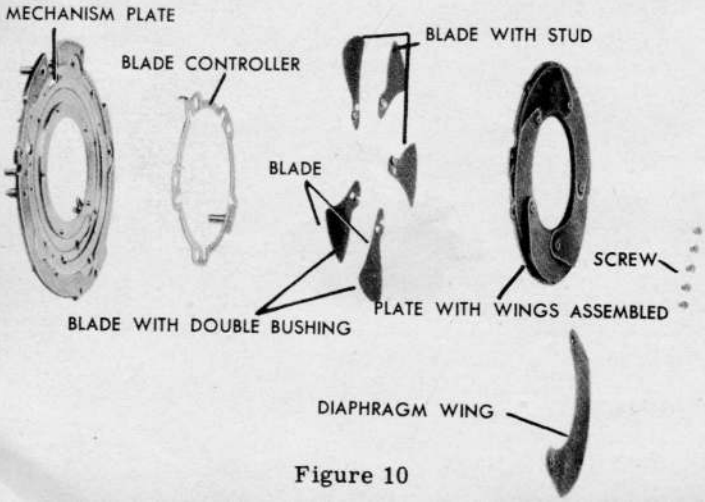


Figure 10

Lift off the TRIGGER and collar ASSEMBLY, one bulb lever SPACER, the BULB LEVER ASSEMBLY, and the BULB LEVER SPRING.

Remove the remaining bulb lever spacer from the BULB LEVER STUD (Figure 12).

Remove the CLUTCH ASSEMBLY (Figure 5) and the CONTACT ESCAPEMENT WHEEL and pinion assembly by removing the retaining screws.

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 6) and lift off the retard gear PLATE COMPLETE. Remove the remainder of the gear train as follows:

1. Retard GEAR WITH NO. 2 PINION assembly.
2. Retard GEAR WITH NO. 3 PINION assembly.
3. ESCAPEMENT WHEEL with No. 4 pinion assembly.
4. Retard PALLET.
5. PALLET BRACKET with stud assembly and the PALLET BRACKET SPRING.

NOTE: If the retard gears are dirty causing the low speeds to be slow, clean all the parts of the retard gear train in carbon tetrachloride and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

Remove the blade controller LATCH SPRING BUSHING (Figure 4) and the blade controller latch spring.

Remove the DETENT SPRING and roller washer SCREW (Figure 5), the detent spring and roller WASHER, and the detent SPRING AND ROLLER ASSEMBLY.

FLASH CONTACT POINTS

Remove the case insulating BUSHING and CONNECTOR SCREW. Lift out the CONTACT SPRING.

Remove the CONTACT BRACKET with contact point ASSEMBLY. Remove the screw which holds the contact insulating BLOCK and lift out the block.

Remove the screw which holds the contact LEVER COMPLETE (Figure 7). Lift off the contact LEVER SPRING and the contact lever complete.

MECHANISM PLATE COMPLETE

Remove the shutter operating disk bearing NUT (Figure 8). Lift off the shutter operating DISK, and the shutter operating disk SPACER.

Remove the three mechanism plate SCREWS (Figure 9). Turn the case over and lift out the MECHANISM PLATE complete.

Remove the five diaphragm retainer plate SCREWS (Figure 10) and lift off the diaphragm retainer PLATE WITH WINGS ASSEMBLED.

Remove the SHUTTER BLADES and the BLADE CONTROLLER with contact stud.

Remove the diaphragm RING (Figure 9). Unhook the setting lever SPRING from the CASE and remove the spring and the SETTING LEVER with stop stud.

REPAIR

BLADE CONTROLLER LATCH (See Figure 11)

If the shutter blades rebound and leave a small opening when closing, the blade controller LATCH (Figure 4) is not properly holding the BLADE CONTROLLER LEVER (Figure 12).

Reshape the latch at point A (Figure 11) to hold the lever of the blade controller tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The blade controller lever should fit freely into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed slightly at point C.

BULB LEVER

If the shutter works instantaneously when set on B (bulb), the tension on the BULB LEVER SPRING (Figure 3) may be weak. Increase the tension on the spring by bending the hooked end toward the case.

Failure of the shutter to operate properly on B may also be caused by improper adjustment of the lug on the side of the TRIGGER and collar ASSEMBLY. If the lug is bent too far toward the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY (Figure 4), it will prevent the end of the BULB LEVER ASSEMBLY (Figure 3) from stopping the disk on the main drive, because the bulb lever will not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever assembly toward the disk.

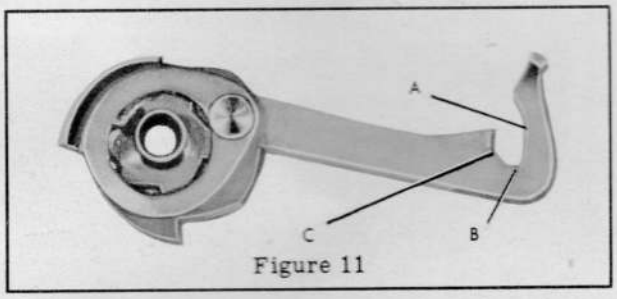


Figure 11

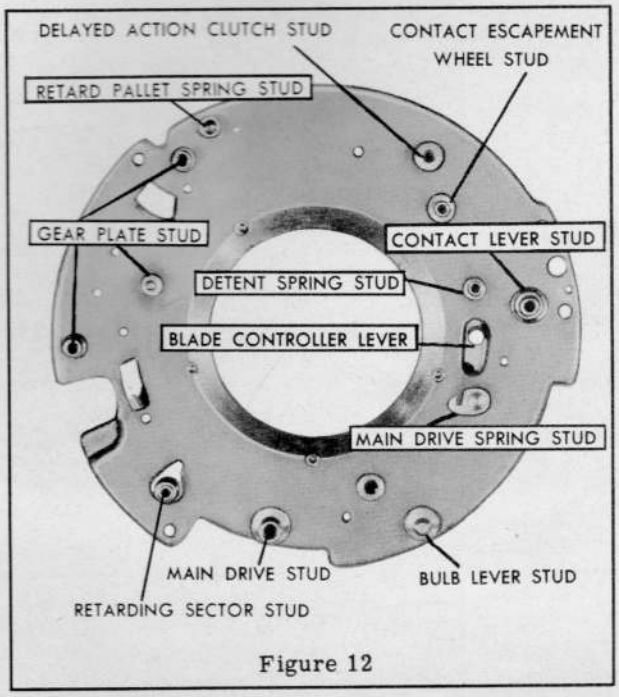


Figure 12

DIAPHRAGM CONTROL RING RETAINER

If the diaphragm CONTROL RING WITH POINTER ASSEMBLED (Figure 1) turns too easily, bend the diaphragm control ring retainer so that the inner edge is higher than the outer edge. When the retainer is fastened in place, the outer edge will bear against the diaphragm control ring with greater tension and prevent the ring from turning so easily.

ADJUSTING SHUTTER SPEEDS

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the 1 second with a stop watch and judge the other speeds as well as possible with a shutter known to be in good adjustment.

1. If the 1 second is slow and all the speeds are slow, the MAIN DRIVE SPRING (Figure 4) has lost some of its tension and should be replaced. Also check to make sure that the shutter blades are not binding.

2. If the 1 second and the remaining low speeds are slow, but the high speeds appear to be correct, the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 6) may be incorrectly meshed so that a full motion of the retard gear train is not obtained.

Uneven shutter speeds (for example, 25, 50, 200 are correct but 100 is fast or slow) should be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the SPEED CONTROL RING with pointers assembled (Figure 1) at the proper point. Filing slows the speeds while swedging increases the speeds.

REASSEMBLY

RETARD GEAR TRAIN

Place the short end of the PALLET BRACKET SPRING (Figure 6) toward the mechanism plate and inside the PALLET BRACKET with stud assembly, allowing the longer end of the spring to extend out toward the edge of the mechanism plate. After fitting the retard PALLET over the stud on the pallet bracket, replace the ESCAPEMENT WHEEL with No. 4 pinion assembly. Replace the retard GEAR WITH NO. 3 PINION assembly and the retard GEAR WITH NO. 2 PINION assembly. Replace the retard gear PLATE COMPLETE, and fasten it with the two retard GEAR PLATE SCREWS. Place the end of the pallet bracket spring over the RETARD PALLET SPRING stud (Figure 12) and allow it to rest against the inner edge of the stud.

MECHANISM PLATE COMPLETE

Replace the BLADE CONTROLLER with contact stud (Figure 10), fitting the BLADE CONTROLLER LEVER (Figure 12) through the small rectangular opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Hold the blades carefully to avoid bending, and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.

With the blade controller lever turned as far as possible toward the retard gear train, replace a BLADE WITH DOUBLE blade BUSHING and stud (Figure 10) with the hole in the blade over the stud on the back of the mechanism plate which is nearest the blade controller lever. The stud on the blade must be turned up, and the bushing on the other side of the blade controller. Proceeding counterclockwise, replace another blade with double blade bushing and stud in the same manner, allowing the wide end of the second blade to overlap the narrow end of the first.

Replace the three BLADES WITH STUD, allowing the wide end of each blade to overlap the narrow end of the preceding blade.

Replace one of the two BLADES over the first blade with double blade bushing and stud. Then replace the remaining blade over the second blade with double blade bushing and stud. The back of the mechanism plate should appear as shown in figure 13.

Replace the diaphragm retainer PLATE WITH WINGS ASSEMBLED (Figure 10) by placing the cut-out slot in the outer edge of the retainer plate over the stud on the PALLET BRACKET with stud assembly (Figure 6). Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate SCREWS (Figure 10). The shutter blades should operate freely at this point.

With the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the side of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom shutter blade. This is done to prevent the shutter blades splitting. Care should be taken not to bend the blades too much or they will bind when fully opened.

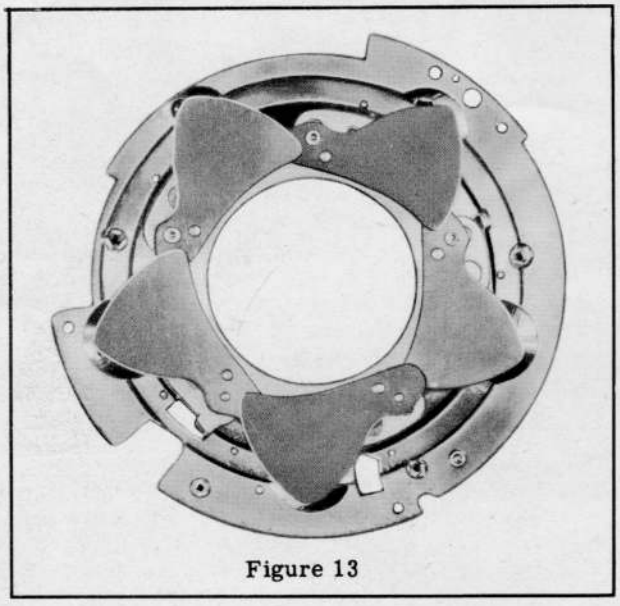


Figure 13

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around in the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

Place the diaphragm ring (Figure 9) in the CASE. Turn the diaphragm ring until the projecting arm is near the cable release nut. Place the SETTING LEVER with stop stud in the case with the setting lever SPRING extending out through the opening in the case an with the stop stud turned toward the cable release nut.

Hold the mechanism plate with the retard gears up and line up the screw hole on the edge of the mechanism plate near the retarding sector with the corresponding hole in the case. Drop the mechanism plate into the case. Hold the mechanism plate in position, and insert the long mechanism plate SCREW. See that the circular projections on the ends of the diaphragm wings are in position in the slots in the ring. The diaphragm wings should now operate properly.

The setting lever with stop stud should move freely. Replace the two short mechanism plate SCREWS.

PARTS ON MECHANISM PLATE

Place the blade controller LATCH SPRING (Figure 4) with the short end of the spring against the retarding sector stud and the loop over the threaded end of the long mechanism plate screw. Screw the blade controller LATCH SPRING BUSHING loosely on the long mechanism plate screw. Hold the long end of the spring tightly against the inside wall of the case and tighten the latch spring bushing so that it holds the spring in place with tension outward toward the case. Secure the loose end of the setting lever spring.

Place one bulb lever SPACER (Figure 3) on the BULB LEVER STUD (Figure 12). With the BULB LEVER SPRING (Figure 3) underneath, hold the TRIGGER and collar ASSEMBLY with the oval hole up and insert the BULB LEVER ASSEMBLY in the opening on the trigger. Place the remaining bulb lever spacer between the top of the trigger and the top of the bulb lever assembly. With the hooked end of the bulb lever spring turned in a clockwise direction, guide the parts down over the bulb lever stud. Insert the hooked end of the bulb lever spring through the small hole in the side of the case.

Place the trigger WASHER over the round hole in the base of the trigger. Hold the TRIGGER SPRING over the WASHER with the short end pointing toward the contact stud of the blade controller. Replace the trigger SCREW. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD (Figure 12) and rest it against the stud.

Hold the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY (Figure 4) with the latch pointing toward the central opening in the mechanism plate and fit the bushing down over the

MAIN DRIVE STUD (Figure 12). Then, grasp the assembly and lift it up enough to fit the stud on the setting lever with stop stud into the slot in the main drive bushing.

Close the shutter blades. Push the blade controller latch toward the blade controller lever, and set the shutter. The cutout portion of the latch will come to rest around the blade controller latch spring and place it inside the vertical lug on the tip of the latch. Replace the main drive SCREW (Figure 4). Trip the shutter and attach the main drive spring to the main drive spring stud.

Set the shutter, and with the long end of the retarding SECTOR SPRING (Figure 6) at the top, replace the retarding SECTOR WITH STUD together with the retarding sector spring on the retarding sector stud. Fasten both parts with the retarding SECTOR SCREW. Lift up the long end of the retarding sector spring and place it against the inner side of the blade controller latch spring bushing.

Loosen slightly the two retard GEAR PLATE SCREWS. Then lift up the pinion end of the gear plate until the teeth of the retarding sector with stud can pass freely under the pinion and place the retarding sector with the outer edge approximately 1/32 inch away from the case. Still lifting up on the retarding gear plate, turn the retard gear plate complete so that the last tooth before the cutout portion (proceeding clockwise) is up against the stud on the retarding sector. Engage the retarding sector with the retard gear plate complete in this position by allowing the pinion end of the gear plate to drop down. If the retarding sector does not become engaged, follow through the procedure again, this time placing the outer edge of the retarding sector a little farther from the case. The retarding sector should be engaged in such a position that it is as close as possible to the case.

FLASH CONTACT POINTS

Replace the contact insulating BLOCK (Figure 7) by attaching it to the bottom of the mechanism plate near the contact lever stud, with the holding screw. While the screw is being tightened, push the opposite end of the block as close to the shutter case as possible.

CAUTION: Care should be taken in tightening the contact insulating block holding screw. If the screw is tightened too much the block may be damaged.

Place the contact LEVER COMPLETE over the CONTACT LEVER STUD (Figure 12). Place the contact LEVER SPRING (Figure 7) over the contact lever bushing with the ends of the spring facing toward the shutter case. Hook the short end of the spring around the upraised part of the contact lever. Pull back on the long end of the spring to place it in tension and rest it in the slot in the case. Secure the contact lever stud with the retaining screw.

CAUTION: The end of the contact lever assembly which rides against the TRIGGER LATCH (Figure 3) must be highly burnished. Do not touch the surface of the contact lever during adjustments.

Insert the case insulating BUSHING (Figure 7) in the opening in the back of the shutter case directly under the contact insulating block. Turn the bushing so that the flat side faces the outer rim of the case.

Set the CONTACT BRACKET with contact point ASSEMBLY over the opening on the top of the contact insulating block.

Set the CONTACT SPRING over the contact bracket with contact point assembly, with the end of the spring near the contact stud on the blade controller as shown in figure 14.

Insert the CONNECTOR SCREW (Figure 7) in the opening in the top of the contact insulating block over which are set the contact bracket with contact point assembly and the contact spring. Push the screw down through the opening in the case insulating bushing and secure the screw in place with the holding nut.

Be sure the bushing does not turn as the screw is tightened. The contact bracket with contact point assembly should be as close to the rim of the shutter case as possible.

Set the detent SPRING AND ROLLER ASSEMBLY (Figure 5) on the DETENT SPRING STUD (Figure 12). The roller held end of the spring should be next to the mechanism plate with the curved portion of the spring touching the base of the contact ESCAPEMENT WHEEL and pinion assembly STUD.

Set the detent spring and roller WASHER (Figure 5) on the detent spring stud with the protruding end of the washer against the spring tension end of the spring.

Hold the curved end of the spring against the base of the contact escapement wheel stud and attach the spring and washer on the stud with the holding screw. Set the CONTACT ESCAPEMENT WHEEL and pinion assembly on the stud and attach it with the retaining screw. Then draw out toward the cen-

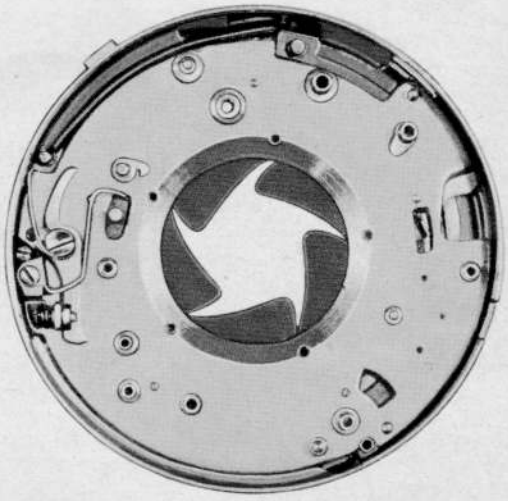


Figure 14

ter of the mechanism plate the detent spring and roller assembly so that the roller travels between the teeth of the contact escapement wheel. Place the clutch assembly on the CLUTCH ASSEMBLY STUD (Figure 12) and secure it in position with the retaining screw.

Set the shutter and then release it and at the same time retard its opening action by placing one finger against the shutter setting lever. Allow the shutter to release slowly at the same time observing whether the BLADE CONTROLLER CONTACT STUD makes SLIGHT contact with the contact spring when the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.

Adjustments to the following parts must be made before the cover complete is replaced on the shutter.

Check the fall of the point on the contact lever complete as it falls between the teeth of the contact escapement wheel. The roller on the end of the spring and roller assembly should be between the teeth of the contact escapement wheel at the same time as the contact lever. If it is not the spring can be shortened or lengthened by bending until the roller falls exactly between the teeth of the contact escapement wheel. When the contact lever falls into the teeth there should be a minimum of play in the escapement wheel. This adjustment will insure against the point of the contact resting on the top point of a tooth of the escapement wheel after the shutter has been set. If it did the winding lever would not lock into position when pulled down.

The top gear on the clutch assembly should only turn freely in a clockwise direction when the lower gear of the clutch assembly is held tight.

Replace the WINDING GEAR with pinion and spring assembly (Figure 5). Hook the end of the spring against the clutch assembly stud and beneath the clutch assembly and the contact escapement wheel.

COVER COMPLETE

Replace the COVER COMPLETE (Figure 2) fitting the shaft on the winding gear with pinion and spring assembly into the hole in the winding gear pinion bracket. Fasten the cover with the two LONG COVER SCREWS and the SHORT COVER SCREW.

Set the shutter and replace the trigger latch with the long bent end of the latch contacting the inner edge of the contact lever complete. Attach it with the TRIGGER LATCH SCREW (Figure 3).

Attach but do not tighten the TRIGGER LATCH SPRING (Figure 2) and the trigger latch SPRING SCREW to the cover. Lift the loose end of the spring over the trigger latch until it is at a point half way between the latch and the central collar on the cover. Tighten the trigger latch spring screw. Lift up the bent end of the spring and place it against the outside edge of the trigger latch. The trigger latch should be burnished at the point of spring contact.

PARTS ON FRONT OF SHUTTER

Replace the winding LEVER (Figure 1) with the sixth or seventh tooth from the left meshed with the winding gear with pinion and spring assembly. Place the winding gear spring in tension by giving two and one-fourth strokes on the winding lever, lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

> CAUTION: In lifting the winding lever between strokes, be careful not to touch the trigger latch because it will move out toward the case and touch the contact lever complete which in turn will release the tension on the winding gear spring.

Trip the shutter and lightly hold the winding lever down around the central collar on the cover at a point near the trigger latch. As the shutter is tripped, the end of the latch should fall into the slot on the cover. If it does not, add more tension on the trigger latch spring. The winding lever should contact the trigger latch, push the latch out of the slot in the cover and open the shutter blades. After the shutter has been tripped the trigger latch should return to a position where the latch is resting on the ledge just above the small slot in the cover.

At this point the end of the contact lever complete should be firmly seated between the teeth of the contact escapement wheel. This will insure that when the shutter is again set and the winding lever is pulled down, it will stay down. If the contact lever assembly is not seated properly in the escapement wheel, the end of the arm on the contact lever which the latch rides against can be formed in very slightly towards the shutter blades. Insert a T.B.I. cable release in the cable release nut to check for trigger contact. As the trigger is forced down, the trigger latch will release the pointer end of the contact lever complete from the contact escapement wheel, but the contact point assemblies should not made contact. There should be a clearance of approximately 1/32 of an inch between the CONTACT BRACKET with contact point assembly (Fig. 7) and the contact point assembly on the contact lever complete. The contact bracket with contact point assembly can be pushed back toward the shutter case until the proper clearance is reached.

After the trigger is pushed down, allow it to return to its proper position very slowly. If there should be too much tension on the trigger latch spring, it will tend to retard the action of the latch. This is also true if there is too much tension between the trigger latch and the contact lever. In a properly fitted contact lever and trigger latch, play between the two should be at a minimum.

Place the flash retard PALLET ASSEMBLY (Figure 2) on the eccentric stud.

> NOTE: Be sure that the pallet stud is tight on the cover. If any adjustment is made on the stud it should be anchored securely in position.

Pull down the winding lever slowly and see that the pallet falls into every tooth of the winding lever. If it does not, turn the eccentric stud until the pallet is closer to the winding lever using special tool No. 657.

With the shutter in a tripped position, replace the HIGH SPEED SPRING (Figure 4) and the high speed spring CAM. Replace the shutter retaining RING (Figure 1).

With the shutter still in the tripped position, replace the SPEED CONTROL RING WITH POINTERS ASSEMBLED, making sure that the projecting lug on the BULB LEVER ASSEMBLY (Figure 3) the studs on the retarding SECTOR WITH STUD (Figure 6) and the PALLET BRACKET with stud assembly are resting against the inside edge of the speed control ring and are not underneath the ring.

Replace the speed control ring TENSION SPRING (Figure 1) in the back of the speed INDEX PLATE. The crimped side of the spring should face toward the back of the shutter so it can fit into the notches in the speed control ring and made the click speed stops operate. Replace the speed index plate and fasten it with the two speed INDEX PLATE SCREWS.

Replace the diaphragm CONTROL RING WITH POINTER ASSEMBLED, fitting the notch opposite the pointer over the projecting lever on the diaphragm ring. Replace the two diaphragm CONTROL RING SPRINGS with the convex sides pointing inward toward the central opening in the shutter.

Replace the diaphragm control ring RETAINER COMPLETE and fasten the retainer with the three diaphragm control ring RETAINER SCREWS.

Replace the shutter operating disk SPACER (Figure 8) on the back of the case. Replace the shutter operating DISK with the projecting lug between the lug on the SETTING LEVER with stop stud (Figure 9) and the trigger, and replace the shutter operating disk bearing NUT (Figure 8).

Replace the rear lens element. Place the shutter on the shutter protector block, tool No. 501-W, and replace the front lens element together with the adapter ring insert. Tighten the lens element with tool No. 501-0, being careful not to tighten the adapter ring insert in the mount.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter very slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open before the winding lever opens them. If this occurs refer to the Trouble Chart.

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerance of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

F	(short stroke)	3 — 5 milleseconds.
M	(long stroke)	12 — 16 milleseconds.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
Shutter does not trip easily	Possible burr on TRIGGER and collar ASSEMBLY (Figure 3).	Burnish the trigger and collar assembly at the point where it contacts the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY (Figure 4) when in a set position.
No Kodatron contact	The contact stud on the BLADE CONTROLLER (Figure 10) is not touching the CONTACT SPRING (Figure 7).	Adjust the contact spring so that it touches the contact stud on the blade controller when the blades are almost fully opened. It is possible to make the adjustment after removing the front lens element.
Shutter blades remain open on high speeds	Split shutter blades.	Replace the shutter blades.
	Loose studs on the shutter blades.	Replace the shutter blades.
	The blade controller LATCH (Figure 4) is loose on the main drive bushing.	Remove the main drive bushing and blade controller latch assembly and tighten the blade controller latch STUD (Figure 4). Bend the straight end of the latch spring downward, so it will hold the latch against the mechanism plate more securely.

TROUBLE	CAUSE	REMEDY
Shutter does not set	The trigger latch is not returning to its proper position after the shutter has been released.	Check the tension on the TRIGGER SPRING (Figure 3). It may be necessary to add tension.
		The trigger latch may be bent and is binding on the speed INDEX PLATE (Figure 1).
		It may be necessary to reduce the tension on the trigger latch spring.
	The contact lever is resting on a point of the escapement wheel.	Adjust the detent spring so that the contact lever will fall between the teeth of the detent gear.
The winding lever does not hold when the shutter is set	The clutch assembly is slipping.	Replace the clutch assembly.
	The contact lever is not seated properly in the escapement wheel.	Adjust the arm of the contact lever where it rides on the trigger latch. If the arm is moved in slightly toward the latch, the point on the contact arm will lock more securely in the escapement wheel.
	The teeth of the escapement wheel are burred.	Replace the escapement wheel.
	The point of the contact arm may not be falling into the escapement wheel properly.	Adjust the detent spring so that when the point of the contact arm falls into the escapement wheel there is a minimum of movement in the gear and no danger of the point resting on a point of the gear.
Shutter speeds slow	Retard gears dirty.	Remove and clean the retard gears.
	The main drive spring is weak.	Replace the MAIN DRIVE SPRING (Figure 4).
	Shutter blades binding.	Remove and clean the shutter blades.
Shutter operates instantaneously on B (bulb)	Tension is weak on the BULB LEVER SPRING.	See page 5.
	The lug on the side of the rectangular opening in the TRIGGER and collar assembly is out of adjustment.	See page 5.
Shutter blades rebound	The blade controller latch is not fitted properly.	See page 5.
Both flash settings are below the millesecond tolerances (fast)	The tension is too great on the WINDING GEAR SPRING (Figure 5).	Relieve the tension slightly on the winding gear spring.
Both flash settings are above the millesecond tolerances (slow)	There is not enough tension on the winding gear spring.	Place the winding gear under slightly greater tension. Care should be taken during this adjustment not to disturb the TRIGGER LATCH (Figure 3).
	The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE (Figure 1).	The index plate will be marked at the binding point. The plate can be filed slightly to allow clearance. The inner surfaces of the winding lever should be burnished and the cover checked for burrs. Be sure the winding lever is not bent.

TROUBLE	CAUSE	REMEDY
The F (short stroke) is within the millesecond tolerances but the M (long stroke) is fast	The flash retard PALLET ASSEMBLY (Figure 2), is not meshing properly with the winding lever.	With special tool No. 657 turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. Make certain the post is tight on the cover after making this adjustment.
	The flash retard pallet assembly may be binding on the speed index plate.	The index plate will be marked at the binding point. File the plate at this point to allow clearance for the pallet.
Constant flash short	The contact POINT ASSEMBLY (Figure 7) has become disassembled.	Replace the contact point assembly.
	Cracked contact insulating BLOCK (Figure 7).	Replace the contact insulating block. The shutter should be checked independently of the camera. If the shutter is working properly, refit it to the camera. If the short persists check the insulating nut on the back of the insulating screw to see that it or any part of the wire is not contacting the focusing tube or light guard.
	The contact spring (Figure 7) may be bent and touching either the contact lever or the cover.	Reform the contact spring.
Both flash settings are extremely fast or below the millesecond tolerances	The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon.	Add more tension to the trigger latch spring.
	The end of the trigger latch is bent back towards the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades.	Reform the end of the trigger latch by bending it slightly towards the winding gear. After the shutter has been assembled, it can be checked to see if the shutter blades will open before the winding lever opens them. 1. Set the shutter 2. Set the winding lever. 3. Holding the winding lever down, release the shutter. The shutter blades should not open while the winding lever is down.

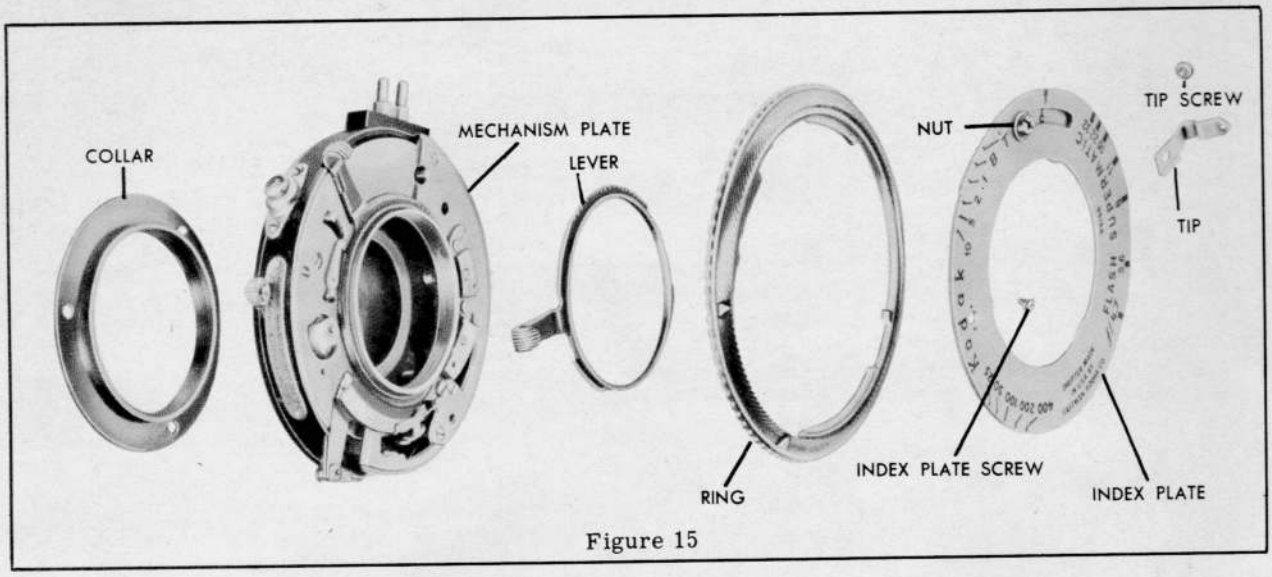


Figure 15

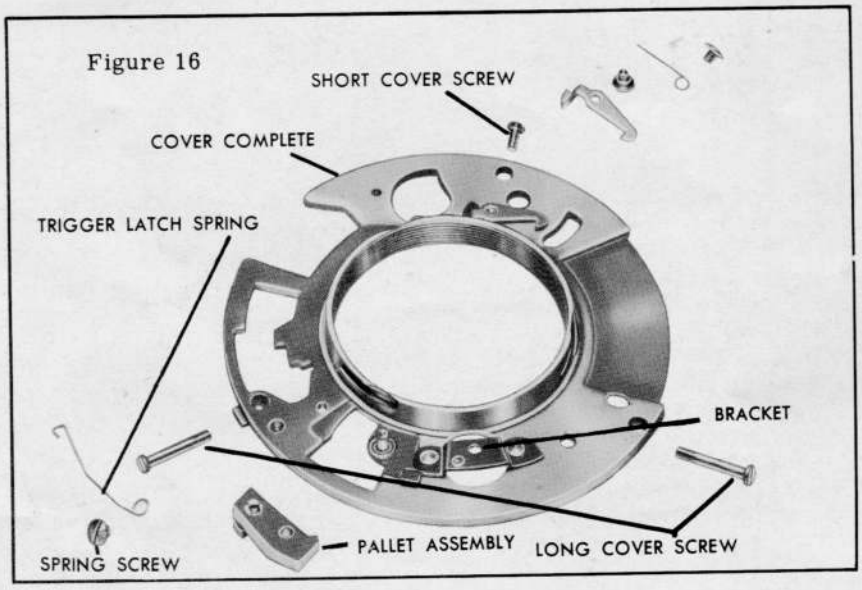


Figure 16

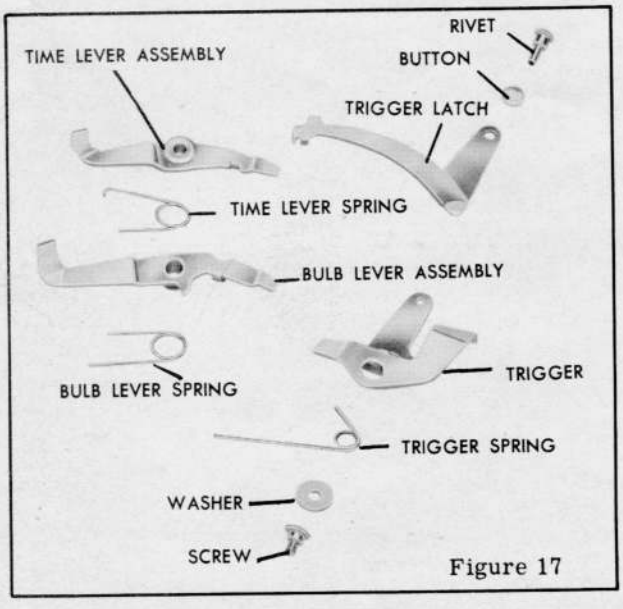


Figure 17

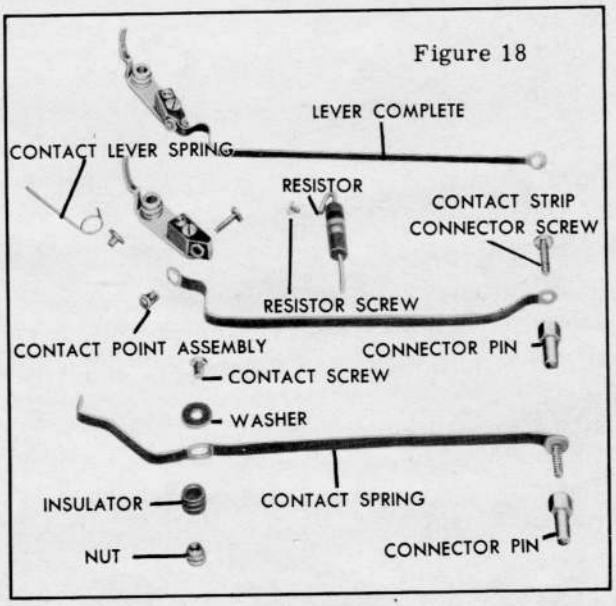


Figure 18

DISASSEMBLY

PARTS ON FRONT OF SHUTTER

Remove the front and rear lens elements from the shutter. Remove the diaphragm pointer TIP (Figure 15) by removing the holding screw. Remove the speed and diaphragm INDEX PLATE SCREW. Loosen the synchronizer scale stud NUT. Remove the speed and diaphragm INDEX PLATE with synchronizer scale by turning the plate counterclockwise until the three projections in the center of the plate fit into the three cutouts on the outside edge of the central collar. Lift off the index plate. Lift off the speed control RING with pointers.

CAUTION: If a minor repair is to be made and the shutter does not have to be completely disassembled below the COVER COMPLETE (Figure 16), care should be taken when removing the speed control ring with pointers. If the winding LEVER (Figure 15) is disturbed at this point the flash timing will have to be adjusted.

Lift off the winding lever.

COVER COMPLETE AND ASSOCIATED PARTS

Remove the trigger latch spring (Figure 16) by removing the trigger latch SPRING SCREW.

If it is necessary to replace the TRIGGER LATCH (Figure 17) remove the trigger button RIVET and the trigger BUTTON. Lift off the trigger latch.

If it is not necessary to replace the trigger latch, lift up on the loose end of the latch sufficient to clear the TIME LEVER ASSEMBLY and the cover complete. Move the loose end of the latch until it is clear of the CASE (Figure 19).

Lift out the high speed spring CAM (Figure 4) and the HIGH SPEED SPRING. Remove the flash retard PALLET ASSEMBLY (Figure 16). Remove the SHORT COVER SCREW and the two LONG COVER SCREWS. Then lift off the cover complete.

PARTS ON MECHANISM PLATE

Lift out the WINDING GEAR with pinion and spring assembly (Figure 5). Remove the retarding SECTOR SCREW (Figure 6). Then set the shutter and lift out the retarding SECTOR WITH STUD and the retarding SECTOR SPRING. Remove the MAIN DRIVE SCREW (Figure 4).

Trip the shutter and unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD (Figure 21). Unhook the blade controller LATCH SPRING (Figure 4) from the blade controller LATCH. Set the shutter and at the same time move the end of the blade controller latch toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY together with the main drive spring.

Open the shutter blades by pushing the BLADE CONTROLLER LEVER (Figure 21). Then open the diaphragm wings. Remove the trigger SCREW (Figure 17), the trigger SPRING, and the trigger WASHER. Lift off the TRIGGER, the TIME LEVER ASSEMBLY, the TIME LEVER SPRING, the BULB LEVER ASSEMBLY, and the BULB LEVER SPRING. Remove the CLUTCH ASSEMBLY (Figure 5) and the CONTACT ESCAPEMENT WHEEL and pinion assembly by removing the retaining screws.

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 6) and lift off the retard gear PLATE COMPLETE. Remove the remainder of the gear train as follows:

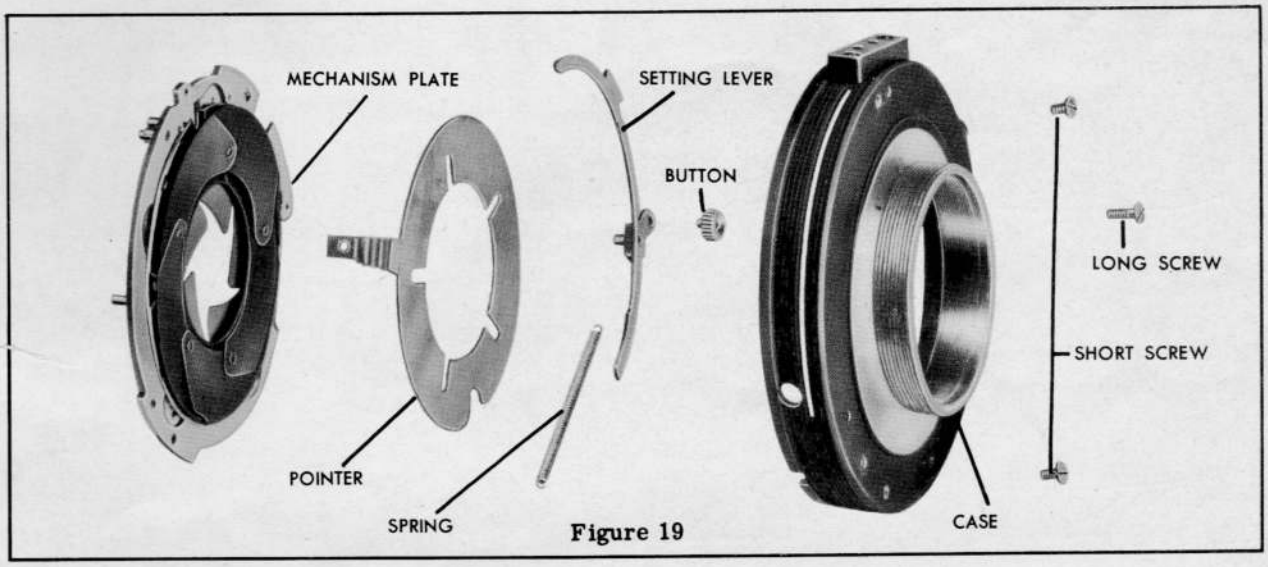


Figure 19

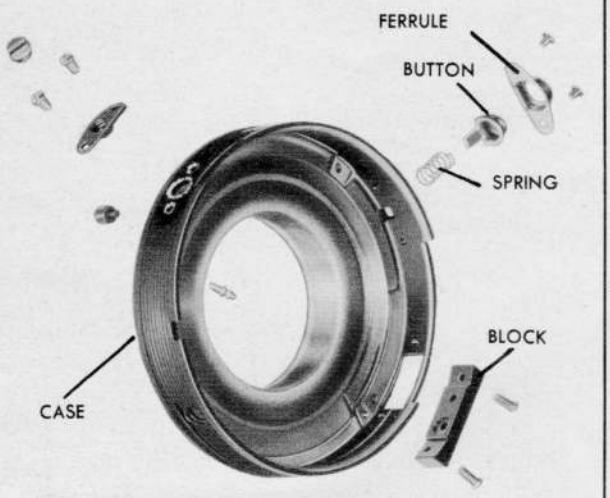


Figure 20

1. Retard GEAR WITH NO. 2 PINION assembly.
2. Retard GEAR WITH NO. 3 PINION assembly.
3. ESCAPEMENT WHEEL with No. 4 pinion assembly.
4. Retard PALLET.
5. PALLET BRACKET with stud assembly and the retard PALLET BRACKET SPRING.

NOTE: If the retard gears are dirty causing the low speeds to be too slow, clean all the parts of the retard gear train in carbon tetrachloride and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

Remove the blade controller LATCH SPRING BUSHING (Figure 4) and the blade controller latch spring. Remove the DETENT SPRING and roller washer SCREW (Figure 5), the detent spring and roller WASHER, and the detent SPRING AND ROLLER ASSEMBLY.

MECHANISM PLATE AND CONTACT POINTS

Using tool No. 635 remove the CONNECTOR PIN (Figure 18) which holds the contact LEVER COMPLETE to the CONNECTOR BLOCK (Figure 20). Remove the ground CONTACT STRIP CONNECTOR SCREW (Figure 18). Disengage the RESISTOR from the mechanism plate by removing the CONTACT SPRING over the top of the contact lever. Remove the contact lever complete and the CONTACT LEVER SPRING by removing the retaining screw.

Using tool No. 635 remove the connector pin which holds the contact spring to the connector block. Holding the CONTACT SCREW with tool No. 262, remove the CONTACT SCREW NUT using tool No. 503L. Remove the CONTACT SCREW, the CONTACT SPRING, the case insulator WASHER and the case INSULATOR.

Remove the three mechanism plate SCREWS (Figure 19). Turn the case over and lift out the MECHANISM PLATE complete (Figure 10). Remove the five diaphragm retainer plate SCREWS and lift off the diaphragm retainer PLATE WITH WINGS ASSEMBLED. Remove the SHUTTER BLADES and the BLADE CONTROLLER with contact stud.

Remove the diaphragm POINTER (Figure 19). Unhook the setting lever SPRING from the CASE, and from the SETTING LEVER with stop stud. If it is necessary to remove the setting lever, the setting lever BUTTON must first be removed.

PARTS ON SHUTTER CASE

Remove the connector block by removing the two holding screws. Remove the blade arrestor button FERRULE (Figure 20), the blade arrestor BUTTON and the blade arrestor button SPRING by removing the two retaining screws.

REPAIR

BLADE CONTROLLER LATCH (See Figure 11)

If the shutter blades rebound and leave a small opening when closing, the blade controller latch is not properly holding the BLADE CONTROLLER LEVER (Figure 21).

Reshape the latch at point A (Figure 11) to hold the lever of the blade controller tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The blade controller lever should fit freely into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed at point C.

BULB LEVER

If the shutter works instantaneously when set on B (bulb), the tension on the BULB LEVER SPRING (Figure 17) may be too weak. Increase the tension on the spring by bending the hooked end toward the case.

Failure of the shutter to operate on B may also be caused by improper adjustment of the lug on the side of the trigger. If the lug is bent too far toward the main drive bushing with disk and blade controller latch assembly, it will prevent the end of the bulb lever from stopping the disk on the main drive, because the bulb lever assembly will not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever assembly toward the disk.

ADJUSTING SHUTTER SPEEDS

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the 1 second with a stop watch and judge the other speeds as well as possible with a shutter known to be in good adjustment.

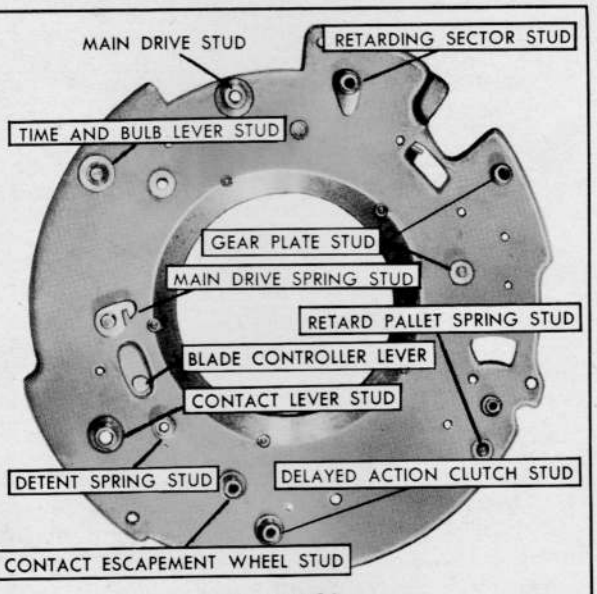


Figure 21

1. If the 1 second is slow and all the speeds are slow, the MAIN DRIVE SPRING (Figure 4) has lost some of its tension and should be replaced. Also check to make sure that the shutter blades are not binding.

2. If the 1 second and the remaining low speeds are slow, but the high speeds appear to be correct, the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 6) may be incorrectly meshed so that a full motion of the retard gear train is not obtained.

Uneven shutter speeds, (for example, 25, 50, and 200 are correct but 100 is fast or slow), should be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the speed control RING with pointers (Figure 15) at the proper point. Filing slows the speeds while swedging increases the speeds.

REASSEMBLY

PARTS ON SHUTTER CASE

Assemble the blade arrestor button SPRING (Figure 20) and the blade arrestor BUTTON to the blade arrestor button FERRULE and attach the assembly to the CASE with the two retaining screws. Attach the connector BLOCK to the case with the two holding screws.

RETARD GEAR TRAIN

Place the short end of the retard PALLET BRACKET SPRING (Figure 6) toward the mechanism plate and inside the PALLET BRACKET with stud assembly, allowing the longer end of the spring to extend out toward the edge of the mechanism plate. After fitting the retard PALLET over the stud on the pallet bracket, replace the ESCAPEMENT WHEEL with No. 4 pinion assembly. Replace the retard GEAR WITH NO. 3 PINION assembly, and the retard GEAR WITH NO. 2 PINION assembly. Replace the retard GEAR PLATE COMPLETE, and fasten it with the two retard GEAR PLATE SCREWS. Place the end of the pallet bracket spring over the RETARD PALLET SPRING STUD (Figure 21) and allow it to rest against the inner edge of the stud.

MECHANISM PLATE AND CONTACT POINTS

Replace the blade controller fitting the BLADE CONTROLLER LEVER (Figure 21) through the small rectangular opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.

With the blade controller lever turned as far as possible toward the retard gear train, replace the BLADE WITH DOUBLE BLADE BUSHING and stud (Figure 10) with the hole in the blade over the stud on the back of the mechanism plate which is nearest the blade controller lever. The stud on the blade must be turned up, and the bushing on the other side of the blade must fit into the cutout slot on the inner edge of the blade controller.

Proceeding counterclockwise, replace the four BLADES WITH STUD allowing the wide end of each blade to over-lap the narrow end of the preceding one. Place the BLADE over the blade with double blade bushing and stud.

Replace the diaphragm retainer PLATE WITH WINGS ASSEMBLED (Figure 10) by placing the cut-out slot in the outer edge of the retainer plate over the stud on the PALLET BRACKET with stud assembly (Figure 6). Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate SCREWS (Figure 10). The shutter blades should operate freely at this point.

With the top of the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the sides of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom shutter blade. This is done to prevent the shutter blades splitting. Care should be taken not to bend the blades too much or they will bind when fully opened.

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around in the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

Replace the diaphragm POINTER (Figure 19) in the case. Turn the diaphragm pointer until the projecting arm is near the cable release nut.

If the setting lever with stop stud was removed, replace it in the case and attach a new setting lever BUTTON to the projecting end of the lever. Attach one end of the setting lever SPRING to the setting lever. Allow the loose end of the spring to extend out through the opening in the case. Move the setting lever toward the cable release nut.

Insert the screw end of the CONTACT SPRING (Figure 18) into the opening in the connector BLOCK (Figure 20) near the diaphragm POINTER (Figure 19). Secure the spring to the block with a CON-

NECTOR PIN (Figure 18). Attach the contact end of the contact spring to the CASE (Figure 20) by replacing the case insulator WASHER (Figure 18) between the shutter case and the contact spring and CONTACT SCREW. Secure the contact spring in place by replacing the case INSULATOR and the contact screw nut. Tighten the nut by holding the contact screw with tool No. 262 and turn the nut with tool No. 503L.

Hold the contact end of the contact spring against the inside of the case, and place the contact lever end of the contact lever complete on the CONTACT LEVER STUD (Figure 21). Place the spring in tension by drawing the long end of the spring around the bushing on the contact lever, down past the end of the contact spring and rest it against the cutout in the side of the case. Insert the ground CONTACT STRIP CONNECTOR SCREW in the opening in the end of the contact LEVER COMPLETE and insert the screw in the remaining opening in the connector block. Secure the contact lever complete to the connector block with the remaining connector pin.

The bent portion of the contact strip which fastens to the contact lever should be formed so that enough tension is exerted on the contact lever to pull it over to touch the contact screw. Secure the RESISTOR (Figure 18) to the mechanism plate with the holding screw. After the contact lever spring has been replaced on the contact lever, the two springs should have enough tension to pull the contact lever against the contact screw and depress the plunger of the contact point assembly in about 2/3 of the way.

NOTE: Whenever a contact screw and nut are reassembled to a shutter case, it is necessary that an insulating seal be applied to the contact screw nut to prevent moisture or foreign objects from grounding the flash circuit to the shutter case. Black Glyptol (quick drying) is recommended as a good insulating material. This must be applied to the contact nut carefully to insure continuous coating.

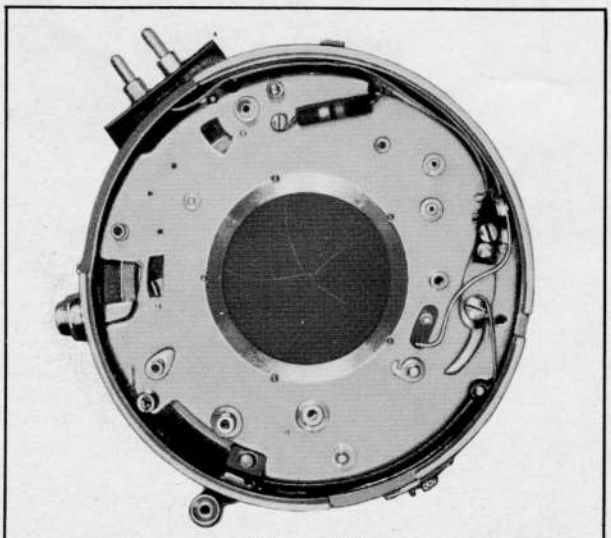


Figure 22

Hold the mechanism plate with the retard gears up and line up the screw hole on the edge of the mechanism plate near the retarding sector, with the corresponding hole in the case. Slip the mechanism plate into the case under the contact end of the contact spring. Hold the mechanism plate in position, and insert the long mechanism plate SCREW. See that the circular projections on the ends of the diaphragm wings are in position in the slots in the ring. The diaphragm wings should now operate properly.

The setting lever with stop stud should move freely. Replace the two short mechanism plate SCREWS. The contact points should appear as shown in Figure 22.

PARTS ON MECHANISM PLATE

Place the blade controller LATCH SPRING (Figure 4) with the short end of the spring against the RETARDING SECTOR STUD (Figure 21) and the loop over the threaded end of the long mechanism plate screw. Screw the blade controller LATCH SPRING BUSHING loosely on the long mechanism plate screw. Hold the long end of the spring tightly against the inside wall of the case and tighten the latch spring bushing so that it holds the spring in place with tension outward toward the case. Secure the loose end of the setting lever spring.

With the BULB LEVER SPRING (Figure 17) underneath, hold the TRIGGER with the oval hole up and insert the BULB LEVER ASSEMBLY in the opening on the trigger. Then place the TIME LEVER ASSEMBLY and the TIME LEVER SPRING between the top of the trigger and on top of the bulb lever assembly with the spring facing up. Grasp all three parts by inserting one prong of a pair of tweezers down through the center of the holes. With the longer ends of the time and bulb lever springs turned in a clockwise direction and the shorter ends resting against the lugs on the levers, guide the parts down over the TIME AND BULB LEVER STUD (Figure 21). The long ends of the springs should rest against the shutter case.

Place the trigger WASHER (Figure 17) over the round hole in the base of the trigger. Hold the trigger spring over the washer with the short end pointing toward the contact stud on the blade controller. Replace the trigger SCREW. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD (Figure 21) and rest it against the stud.

With the MAIN DRIVE SPRING (Figure 4) hooked in the small hole in the disk on the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY, hold the assembly with the blade controller LATCH pointing toward the central opening in the mechanism plate, and fit the bushing down over the MAIN DRIVE STUD (Figure 21). Then grasp the assembly and lift it up enough to fit the stud on the SETTING LEVER with stop stud (Figure 19) into the slot in the main drive bushing.

Close the shutter blades. Push the blade controller latch toward the BLADE CONTROLLER LEVER (Figure 21) and set the shutter. The cutout portion of the latch will come to rest around the blade controller lever. Lift up the long end of the blade controller latch spring and place it inside the

vertical lug on the tip of the latch. Replace the main drive SCREW (Figure 4). Trip the shutter and attach the main drive spring to the main drive spring stud.

Set the shutter, and with the long end of the retarding SECTOR SPRING (Figure 6) at the top replace the retarding SECTOR WITH STUD together with the retarding sector spring on the retarding sector stud. Fasten both parts with the retarding SECTOR SCREW. Then lift up the long end of the retarding sector spring and place it against the inner side of the blade controller latch spring bushing.

Loosen slightly the two retard GEAR PLATE SCREWS which hold the retard gear PLATE COMPLETE. Lift up the pinion end of the gear plate until the teeth of the retarding sector with stud can pass freely under the pinion and place the retarding sector with the outer edge approximately 1/32 inch away from the case. Still lifting up on the retard gear plate, turn the retard gear plate complete so that the last tooth before the cutout portion (proceeding clockwise) is up against the stud on the retarding sector. Engage the retarding sector with the retard gear plate complete in this position by allowing the pinion end of the gear plate to drop down. If the retarding sector does not become engaged, follow through the procedure again, this time placing the outer edge of the retarding sector a little farther from the case. The retarding sector should be engaged in such a position that it is as close as possible to the case. When the retarding sector is properly adjusted, the shutter will stay open somewhat longer than one second if it is tripped at this stage of reassembly.

Set the detent SPRING AND ROLLER ASSEMBLY (Figure 5) on the DETENT SPRING STUD (Figure 21). The roller held end of the spring should be next to the mechanism plate with the curved portion of the spring touching the base of the CONTACT ESCAPEMENT WHEEL STUD.

Set the detent spring and roller WASHER (Figure 5) on the detent spring stud with the protruding end of the washer against the spring tension end of the spring.

Hold the curved end of the spring against the base of the contact escapement wheel stud and attach the spring and washer on the stud with the holding screw. Set the CONTACT ESCAPEMENT WHEEL and pinion assembly on the stud and attach it with the retaining screw. Then draw out toward the center of the mechanism plate the detent spring and roller assembly so that the roller travels between the teeth of the contact escapement wheel.

Place the CLUTCH ASSEMBLY on the CLUTCH ASSEMBLY STUD (Figure 21) and secure it in position with the retaining screw. Set the shutter. Then release the shutter by pushing on the trigger. At the same time retard the opening action of the shutter by placing one finger against the shutter setting lever. Allow the shutter to release slowly at the same time observing whether the BLADE CONTROLLER CONTACT STUD makes slight contact with the contact spring when the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.

When the shutter blades are being held open with the BLADE ARRESTOR BUTTON (Figure 20), the BLADE CONTROLLER CONTACT STUD should not touch the contact spring.

After adjusting the contact spring it should not touch the contact lever, or it should not be raised so high that it will touch the COVER COMPLETE (Figure 16) when it is replaced.

Adjustments to the following parts must be made before the cover complete is replaced on the shutter.

Check the fall of the point on the contact lever complete as it falls between the teeth of the contact escapement wheel. The roller on the end of the spring and roller assembly should be between the teeth of the contact escapement wheel at the same time as the contact lever. If it is not, the spring can be shortened or lengthened by bending it until the roller falls exactly between the teeth of the contact escapement wheel.

When the contact lever falls into the teeth there should be no movement in the escapement wheel. This adjustment will insure against the point of the contact resting on the top of the escapement wheel after the shutter has been set. If it did, the winding lever could not lock into position when pulled down.

The top gear on the clutch assembly should only turn freely in a clockwise direction when the lower gear of the clutch assembly is held tight.

Replace the WINDING GEAR with pinion and spring assembly (Figure 5). Hook the end of the spring against the clutch assembly stud and beneath the clutch assembly and the escapement wheel.

COVER COMPLETE

Replace the COVER COMPLETE (Figure 16) fitting the shaft on the winding gear with pinion and spring assembly into the hole in the winding gear pinion BRACKET. Fasten the cover with the two LONG COVER SCREWS and the SHORT COVER SCREW.

Set the shutter and replace the TRIGGER LATCH (Figure 17) with the long bent end of the latch contacting the inner edge of the contact lever complete.

Attach but do not tighten the TRIGGER LATCH SPRING (Figure 16) to the cover with the trigger latch SPRING SCREW. Lift the loose end of the spring over the trigger latch until it is half way between the latch and the central collar on the cover.

Tighten the trigger latch spring screw. Lift the bent end of the spring and place it against the outside edge of the trigger latch. The trigger latch should be burnished at the point of spring contact.

PARTS ON FRONT OF SHUTTER

Replace the winding LEVER (Figure 15) with the sixth or seventh tooth from the left meshed with the winding gear with pinion and spring assembly. Place the winding gear spring in tension by giving two and one-half strokes on the winding lever lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

> CAUTION: In lifting the winding lever between strokes, be careful not to touch the trigger latch because it will move out toward the case and touch the contact lever complete which in turn will release the tension on the winding gear spring.

Trip the shutter, and with the point of a jeweler's screwdriver, lightly hold the winding lever down around the central collar on the cover complete at a point near the trigger latch. As the shutter is tripped, the end of the latch should fall into the slot on the cover. If it does not, add more tension on the trigger latch spring.

The winding lever should contact the trigger latch, push the latch out of the slot in the cover and open the shutter blades. After the shutter has been tripped the trigger latch should return to a position where the latch is resting on the ledge just above the small slot in the cover.

At this point the end of the contact LEVER COMPLETE (Figure 18) should be firmly seated between the teeth of the contact escapement wheel. This will insure that when the shutter is again set and the winding lever is pulled down, it will stay down.

If the end of the contact lever is not seated in the escapement wheel, disconnect the trigger latch spring and lift up the trigger latch to allow freer movement for the contact lever.

With the point of a jeweler's screwdriver resting against the case, place the blade against the outer edge of the contact lever and push it very slightly towards the shutter blades. Check for trigger contact. As the trigger is forced down, the trigger latch will release the pointed end of the contact lever complete from the contact escapement wheel, but the CONTACT POINT ASSEMBLY should not make contact with the CONTACT SCREW on the CONTACT SPRING. They should be as close as possible without making contact.

After the trigger is pushed down, allow it to return to its proper position very slowly. If there should be too much tension on the trigger latch spring, it will tend to retard the action of the latch. This is also true if there is too much tension between the trigger latch and the contact lever. In a properly fitted contact lever and trigger latch, play between the two should be at a minimum. Place the flash retard PALLET ASSEMBLY (Figure 16) on the eccentric stud. Set the shutter.

Pull down the winding lever slowly to see that the pallet falls into every tooth of the winding lever. If it does not operate correctly, turn the eccentric stud until the pallet is closer to the winding lever using special tool No. 657.

NOTE: Be sure that the pallet stud is tight on the cover. If any adjustment is made on the stud it should be anchored securely in position. With the shutter in a tripped position, replace the high speed SPRING (Figure 4) and the high speed spring CAM.

With the shutter still in the tripped position, replace the speed control RING with pointers (Figure 15), making sure that the projecting lug on the BULB LEVER ASSEMBLY (Figure 17), the studs on the retarding SECTOR WITH STUD (Figure 6), and the PALLET BRACKET with stud assembly are resting against the inside edge of the speed control ring and are not underneath the ring.

Line up the three projections in the center of the speed and diaphragm INDEX PLATE (Figure 15) with synchronizer scale with the three cutouts on the outside edge of the central collar. This alignment should be such that the opening in the index plate for the INDEX PLATE SCREW is as near as possible to the hole in the top of the main drive screw to which the index plate screw is attached.

Replace the diaphragm pointer TIP and secure it with the holding screw. Tighten the synchronizer scale stud nut. Replace the front and rear lens elements.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter very slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open before the winding lever opens them. If this occurs refer to the Trouble Chart.

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

F	(short stroke)	3 —	5 milleseconds.
M	(long stroke)	12 —	16 milleseconds.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
No Kodatron contact	The contact stud on the BLADE CONTROLLER (Figure 10) is not touching the CONTACT SPRING (Figure 18).	Adjust the contact spring so that it touches the contact stud on the blade controller when the blades are almost fully opened. It is possible to make the adjustment after removing the front lens element. There should be no Kodatron contact when the shutter blades are held open by the blade arrestor button.
Shutter blades remain open	Split shutter blades.	Replace the shutter blades.
	Loose studs on shutter blades.	Replace the shutter blades.
	Blade controller LATCH (Figure 4) loose on the main drive bushing.	Remove the latch from the lever on the blade controller. Tighten the blade controller latch STUD (Figure 4). Bend the straight end of the latch spring downward, so it will hold the latch against the MECHANISM PLATE (Figure 10) more securely. Must work freely.
Shutter will not set	The TRIGGER LATCH (Figure 17) is not returning to its proper position after the shutter has been released.	Check the tension on the TRIGGER SPRING (Figure 17). It may be necessary to add tension. The trigger latch may be bent and is binding on the speed INDEX PLATE (Figure 15). It may be necessary to relieve tension on the TRIGGER LATCH SPRING (Figure 16).
	The contact lever is resting on a point of the escapement wheel.	Adjust the DETENT SPRING (Figure 5) so that the contact lever will fall between the teeth of the detent gear.
The winding lever does not hold when set	The clutch assembly is slipping.	Replace the clutch assembly.
	The contact lever may not be seated properly in the escapement wheel.	Adjust the arm of the contact lever where it rides on the trigger latch. If the arm is moved in slightly toward the latch, the point on the contact arm will lock more securely in the escapement wheel.
	The teeth on the escapement wheel may be burred.	Replace the escapement wheel.
	The point of the contact arm may not be falling into the escapement wheel properly.	Adjust the detent spring so that when the point of the contact arm falls into the escapement wheel there is a minimum of movement in the gear and no danger of the point resting on a point of the gear.
Shutter speeds slow	Retard gears dirty.	Remove and clean.
	The MAIN DRIVE SPRING (Figure 4) weak.	Fit a new main drive spring.
	Shutter blades binding.	Remove and clean the shutter blades and replace if necessary.

TROUBLE	CAUSE	REMEDY
Shutter operates instantaneously on "Bulb"	The tension is weak on the BULB LEVER SPRING (Figure 17).	See page 14.
	The lug on the side of the rectangular opening in the trigger is out of adjustment.	See page 14.
Shutter blades rebound	Blade controller latch does not fit properly.	See page 14.
Both flash settings are below the millesecond tolerances (fast)	The tension is too great on the WINDING GEAR SPRING (Figure 5).	Relieve the tension slightly on the winding gear spring.
Both flash settings are above the millesecond tolerances (slow)	There is not enough tension on the winding gear spring.	Place the winding gear under slightly greater tension. Care should be taken during this adjustment not to disturb the TRIGGER LATCH (Figure 17).
	The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE (Figure 15).	The index plate will be marked at the binding point. The plate can be filed slightly to allow clearance. The inner surfaces of the winding lever should be burnished and the cover checked for burrs. Be sure the winding lever is not bent.
The F (Short stroke) is within the millesecond tolerances but the M (long stroke) is fast	The flash retard PALLET ASSEMBLY (Figure 16), is not meshing properly with the winding lever.	With special tool No. 657 turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. Make certain that the post is tight on the cover after making this adjustment.
Constant flash short	Cracked contact insulating block on the contact lever, or the insulating block retaining screw is loose.	Replace the contact insulating block, or tighten the retaining screw.
	The contact strip insulation may be scraped off.	Replace the damaged strip.
	The end of the contact spring may be touching the cover or the contact lever.	Readjust the contact spring.
	The CONTACT SPRING (Figure 18) may be bent and touching either the contact lever or the cover.	Reform the contact spring.
Both flash settings are extremely fast or be low the millesecond tolerances	The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon.	Add more tension on the trigger latch spring.
	The end of the trigger latch is bent back towards the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades.	Reform the end of the trigger latch by bending it slightly towards the winding gear. After the shutter has been assembled, it can be checked to see if the shutter blades will open before the winding lever opens them. 1. Set the shutter 2. Set the winding lever. 3. Holding the winding lever down, release the shutter. The shutter blades should not open while the winding lever is down.

DISASSEMBLY

PARTS ON FRONT OF SHUTTER

Remove the front and rear lens elements from the shutter. Remove the diaphragm pointer TIP (Figure 23) by removing the holding screw. Remove the speed and diaphragm INDEX PLATE SCREW. Remove the speed and diaphragm INDEX PLATE by turning the plate counterclockwise until the three projections in the center of the plate fit into the three cutouts on the outside edge of the central collar. Lift off the index plate. Lift off the speed control RING with pointers.

COVER COMPLETE

Remove the SHORT COVER SCREW (Figure 24) and the two LONG COVER SCREWS. Then lift off the COVER COMPLETE.

Lift out the high speed spring CAM (Figure 4) and the HIGH SPEED SPRING.

PARTS ON MECHANISM PLATE

Remove the retarding SECTOR SCREW (Figure 6). Then set the shutter and lift out the retarding SECTOR WITH STUD and the retarding SECTOR SPRING. Remove the main drive SCREW (Figure 4).

Trip the shutter. Unhook the MAIN DRIVE SPRING (Figure 19) from the MAIN DRIVE SPRING STUD (Figure 27), and the blade controller LATCH SPRING (Figure 19) from the blade controller LATCH. Set the shutter and at the same time move the end of the blade controller latch toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY together with the main drive spring.

Open the shutter blades by pushing the BLADE CONTROLLER LEVER (Figure 27). Then open the diaphragm wings. Remove the trigger SCREW (Figure 25), the TRIGGER SPRING, and the trigger WASHER. Lift off the TRIGGER, the TIME LEVER ASSEMBLY, the TIME LEVER SPRING, the BULB LEVER ASSEMBLY, and the BULB LEVER SPRING.

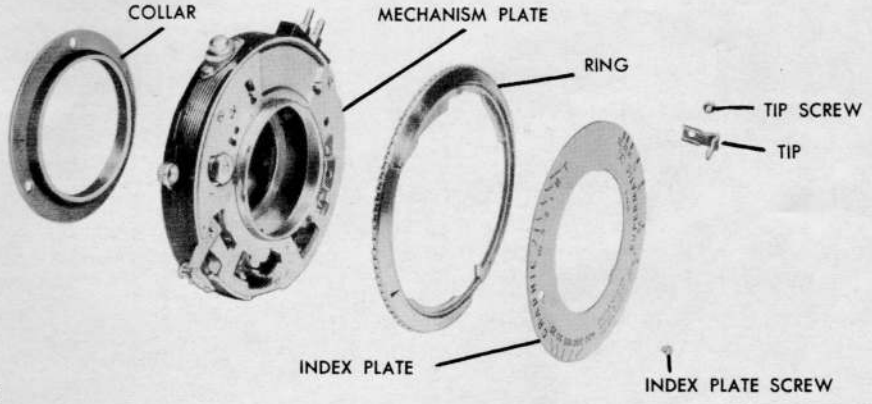


Figure 23

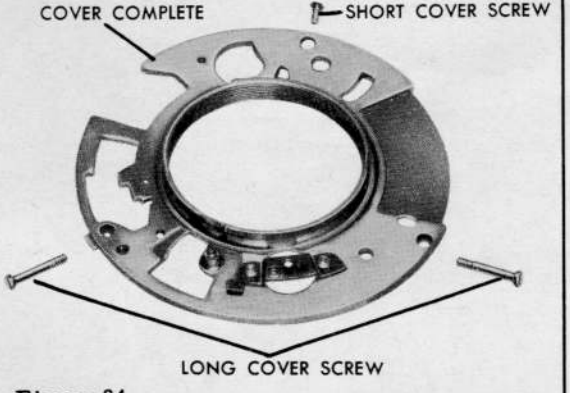


Figure 24

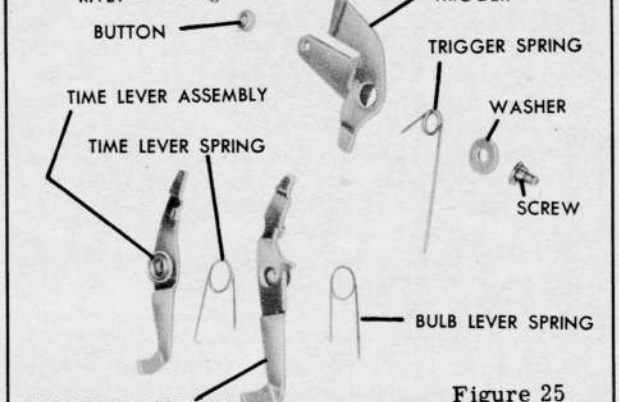


Figure 25

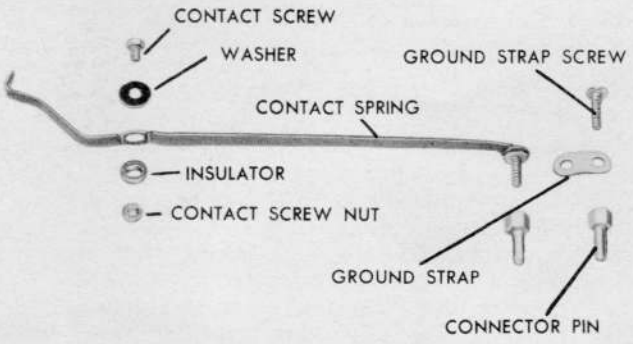


Figure 26

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 6) and lift off the retard GEAR PLATE COMPLETE. Remove the remainder of the gear train as follows:

1. Retard GEAR WITH NO. 2 PINION assembly.
2. Retard GEAR WITH NO. 3 PINION assembly.
3. ESCAPEMENT WHEEL with No. 4 pinion assembly.
4. Retard PALLET.
5. PALLET BRACKET with stud assembly and the PALLET BRACKET SPRING.

NOTE: If the retard gears are dirty causing low speeds to be slow, clean all parts of the retard gear train in carbon tetrachloride, and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

Remove the blade controller LATCH SPRING BUSHING (Figure 4) and the blade controller latch spring.

MECHANISM PLATE AND CONTACT POINTS

Remove the CONNECTOR PIN (Figure 26) nearest the diaphragm POINTER (Figure 19). Turn off the CONTACT SCREW NUT (Figure 26) on the outside of the case, using tool No. 503L. Remove the CONTACT SCREW, the case insulator WASHER, the CONTACT SPRING and the case INSULATOR. Remove the GROUND STRAP by removing the remaining connector pin and the GROUND STRAP SCREW.

Remove the three mechanism plate SCREWS (Figure 19). Turn the CASE over and lift out the MECHANISM PLATE complete (Figure 10). Remove the five diaphragm retainer plate SCREWS and lift off the diaphragm retainer PLATE WITH WINGS ASSEMBLED.

Remove the SHUTTER BLADES and the BLADE CONTROLLER with contact stud. Remove the diaphragm POINTER (Figure 19). Unhook the setting lever SPRING from the case, and from the SETTING LEVER with stop stud. If it is necessary to remove the setting lever, the setting lever BUTTON must first be removed.

PARTS ON SHUTTER CASE

Remove the connector BLOCK (Figure 20) by removing the two holding screws. Remove the blade arrestor button FERRULE, the blade arrestor BUTTON and the blade arrestor button SPRING by removing the two retaining screws.

REPAIR

BLADE CONTROLLER LATCH (See figure 11).

If the shutter blades rebound and leave a small opening when closing, the blade controller LATCH (Figure 4) is not properly holding the BLADE CONTROLLER LEVER (Figure 27).

Reshape the latch at point A (Figure 11) to hold the lever of the blade controller tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The blade controller lever should fit freely into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed slightly at point C.

BULB LEVER

If the shutter works instantaneously when set on B (bulb), the tension on the BULB LEVER SPRING (Figure 25) may be weak. Increase the tension on the spring by bending the hooked end toward the case.

Failure of the shutter to operate properly on B may also be caused by improper adjustment of the lug on the side of the trigger. If the lug is bent too far toward the main drive bushing with disk and blade controller latch assembly, it will prevent the end of the bulb lever from stopping the disk on the main drive, because the bulb lever assembly will

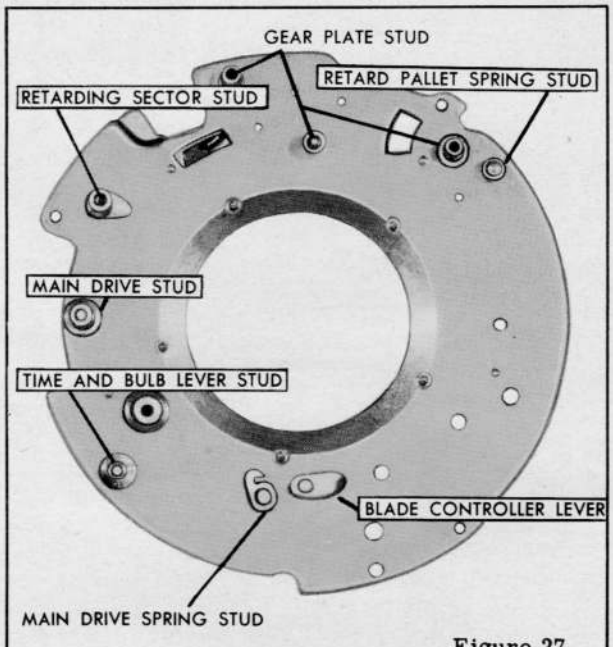


Figure 27

not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever assembly toward the disk.

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the 1 second with a stop watch and judge the other speeds as well as possible with a shutter known to be in good adjustment.

1. If the 1 second is slow and all the speeds are slow, the MAIN DRIVE SPRING (Figure 19) has lost some of its tension and should be replaced. Also check to make sure that the shutter blades are not binding.

2. If the 1 second and the remaining low speeds are slow, but the high speeds appear to be correct, the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 6) may be incorrectly meshed so that a full motion of the retard gear train is not attained.

Uneven shutter speeds (for example, 25, 50, and 200 are correct but 100 is fast or slow) should be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the SPEED CONTROL RING with pointers assembled (Figure 23) at the proper point. Filing slows the speeds while swedging increases the speeds.

REASSEMBLY

PARTS ON SHUTTER CASE

Assemble the blade arrestor button SPRING (Figure 20) and the blade arrestor BUTTON to the blade arrestor button FERRULE and attach the assembly to the CASE with the two retaining screws. Attach the connector BLOCK to the case with the two holding screws.

RETARD GEAR TRAIN

Place the short end of the PALLET BRACKET SPRING (Figure 6) toward the mechanism plate and inside the PALLET BRACKET with stud assembly, allowing the longer end of the spring to extend out toward the edge of the mechanism plate. After fitting the retard pallet over the stud on the pallet bracket, replace the ESCAPEMENT WHEEL with No. 4 pinion assembly. Replace the retard GEAR WITH NO. 3 PINION assembly and the retard GEAR WITH NO. 2 PINION assembly. Replace the retard gear PLATE COMPLETE, and fasten it with the two retard GEAR PLATE SCREWS. Place the end of the pallet bracket spring over the RETARD PALLET SPRING STUD (Figure 27).

MECHANISM PLATE AND CONTACT POINTS

Replace the blade controller, fitting the BLADE CONTROLLER LEVER (Figure 27) through the small rectangular opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Hold the blades carefully to avoid bending, and clean their surfaces with a soft cloth. Finger prints on the blades will cause corrosion.

With the blade controller lever turned as far as possible toward the retard gear train, replace a BLADE WITH DOUBLE blade BUSHING and stud (Figure 10) with the hole in the blade over the stud on the back of the mechanism plate which is nearest the blade controller lever. The stud on the blade controller must be turned up, and the bushing on the other side of the blade must fit into the cutout slot on the inner edge of the blade controller.

Proceeding counterclockwise, replace the four BLADES WITH STUD allowing the wide end of each blade to overlap the narrow end of the preceding one. Place the BLADE over the blade with double blade bushing and stud.

Replace the diaphragm retainer PLATE WITH WINGS ASSEMBLED by placing the cutout slot in the outer edge of the retainer plate over the stud on the pallet bracket with stud assembly. Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate screws. The shutter blades should operate freely at this point.

With the top of the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the side of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom shutter blade. This is done to prevent the shutter blades from splitting. Care should be taken not to bend the blades too much or they will bind when full opened.

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

Replace the diaphragm POINTER (Figure 19) in the case. Turn the pointer clockwise until the projecting arm on the pointer is at the end of the slot in the case, near the cable release nut.

If the setting lever with stop stud was removed, replace it in the case and attach a new setting lever BUTTON to the projecting end of the lever. Attach

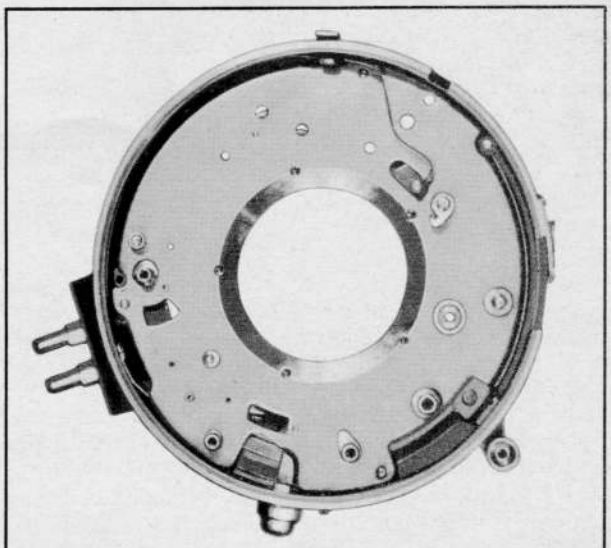


Figure 28

one end of the setting lever SPRING to the setting lever. Allow the loose end of the spring to extend out through the opening in the case. Move the setting lever toward the cable release nut.

Attach the GROUND STRAP (Figure 26) to the inside of the case with the GROUND STRAP SCREW and the CONNECTOR PIN. Insert the screw end of the CONTACT SPRING in the remaining opening in the connector BLOCK and secure the end of place with the remaining connector pin. Attach the contact end of the contact spring to the case by replacing the case insulator WASHER and the CONTACT SCREW. Secure the spring in place with the case INSULATOR and the contact screw nut. The contact points should appear as shown in fig. 28.

NOTE: Whenever a contact screw and nut are reassembled to a shutter case, it is necessary that an insulating seal be applied to the contact screw nut to prevent moisture or foreign objects from grounding the flash circuit to the shutter case. Black Glyptol (quick drying) is recommended as a good insulating material. This must be applied to the contact nut carefully to insure a continuous coating.

Hold the mechanism plate with the retard gears up and line up the screw hole on the edge of the mechanism plate near the retarding sector with corresponding hole in the case. Slip the mechanism plate into the case, under the contact end of the contact spring. Hold the mechanism plate in position, and insert the long mechanism plate SCREW (Figure 19). See that the circular projections on the ends of the diaphragm wings are in position in the slots in the ring. The diaphragm wings should now operate properly. The setting lever with stop stud should move freely. Replace the two short mechanism plate screws.

PARTS ON MECHANISM PLATE

Secure the loose end of the setting lever spring. With the BULB LEVER SPRING (Figure 25) underneath, hold the TRIGGER with the oval hole up and insert the BULB LEVER ASSEMBLY in the opening on the trigger. Place the TIME LEVER ASSEMBLY and the TIME LEVER SPRING between the top of the trigger and the top of the bulb lever assembly with the spring facing up. Then grasp all three parts by inserting one prong of a pair of tweezers down through the center of the holes. With the longer ends of the time and bulb lever spring turned in a clockwise direction and the shorter ends resting against the lugs on the levers, guide the parts down over the TIME AND BULB LEVER STUD (Figure 27). The long ends of the springs should rest against the case.

Place the trigger WASHER (Figure 25) over the round hole in the base of the trigger. Hold the TRIGGER SPRING over the washer with the short end pointing toward the contact stud on the blade controller. Replace the trigger SCREW. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD (Figure 27) and rest it against the stud.

With the MAIN DRIVE SPRING (Figure 4) hooked in the small hole in the disk on the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY, hold the assembly with the latch pointing toward the central opening in the mechanism plate, and fit the bushing down over the MAIN DRIVE STUD (Figure 27). Then grasp the assembly and lift it up enough to fit the stud on the SETTING LEVER with stop stud (Figure 19) into the slot in the main drive bushing.

Close the shutter blades. Push the blade controller latch toward the blade controller lever, and set the shutter. The cutout portion of the latch will come to rest around the blade controller latch. Lift up the long end of the blade controller latch spring and place it inside the vertical lug on the tip of the latch. Replace the main drive SCREW (Figure 4). Trip the shutter. Attach the main drive spring to the main drive spring stud.

Set the shutter, and with the long end of the retarding SECTOR SPRING (Figure 6) at the top replace the retarding sector spring on the RETARDING SECTOR STUD (Figure 27). Fasten both parts with the retarding SECTOR SCREW (Figure 6). Then lift up the long end of the retarding sector spring and place it against the inner edge of the blade controller LATCH SPRING BUSHING (Fig. 4).

Loosen slightly the two retard GEAR PLATE SCREWS (Figure 6) which hold the retard gear PLATE COMPLETE. Then lift up the pinion end of the gear plate until the teeth of the retarding sector with stud can pass freely under the pinion place the retarding sector with the outer edge approximately 1/32 inch away from the case. Still lifting up on the retard gear plate complete, turn so that the last tooth before the cutout portion (proceeding clockwise) is up against the stud on the retarding sector. Engage the retarding sector with the retard gear plate complete in this position by allowing the pinion end of the gear plate to drop down. If the retarding sector does not become engaged, follow through the procedure again, this time placing the outer edge of the retarding sector a little farther from the case. The retarding sector should be engaged in such a position that it is as close as possible to the case. When the retarding sector is properly adjusted, the shutter will stay open somewhat longer than one second if it is tripped at this stage of reassembly.

Set the shutter. Then release the shutter by pushing on the trigger. At the same time retard the opening action of the shutter by placing one finger against the shutter setting lever. Allow the shutter to release slowly at the same time observing whether the contact stud on the blace controller makes contact with the contact spring when the blades are open approximately all the way.

There should be no contact when the blades are held open with the blade arrestor.

COVER COMPLETE

Replace the COVER COMPLETE (Figure 24). Fasten the cover with the two LONG COVER SCREWS and the SHORT COVER SCREW. With the shutter in a tripped position, replace the HIGH SPEED SPRING (Figure 4). Replace the high speed spring CAM.

Replace the speed control RING with pointers assembled (Figure 23), making sure that the projecting lug on the BULB LEVER ASSEMBLY (Figure 25) and the studs on the retarding SECTOR WITH STUD (Figure 6) and the PALLET BRACKET with stud assembly are resting against the inside edge of the speed control ring and are not underneath the ring.

Line up the three projections in the center of the speed and diaphragm INDEX PLATE with synchronizer scale (Figure 23) with the three cutouts on the outside edge of the central collar. This alignment should be such that the opening in the index plate for the INDEX PLATE SCREW is as near as possible to the hole in the main drive screw to which the index plate screw is attached. Turn the index plate clockwise until it locks in position. Replace the index plate screw.

Replace the diaphragm pointer TIP and secure it with the holding screw. Replace the front and rear lens elements.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
Shutter blades stay open	Split shutter blades.	Replace the shutter blades.
	Loose studs on shutter blades.	Replace the shutter blades.
	The BLADE CONTROLLER LATCH (Figure 4) is loose on the main drive bushing.	Remove the latch from the blade controller lever. Tighten the blade controller latch STUD (Figure 4). Bend the latch spring downward, so it will hold the latch against the mechanism plate more securely.
Shutter speeds slow	Retard gears dirty.	Remove and clean the retard gears.
	The MAIN DRIVE SPRING (Figure 19) is weak.	Replace the main drive spring.
	The shutter blades are binding.	Remove and clean the shutter blades.
Shutter operates instantaneously on "Bulb"	Tension is weak on the BULB LEVER SPRING (Figure 25).	See page 22.
	Lug on the side of the rectangular opening in the trigger is out of adjustment.	See page 22.
Shutter blades rebound	The blade controller latch does not fit properly.	See page 22.
No Kodatron contact	The contact stud on the BLADE CONTROLLER (Figure 10) is not touching the CONTACT SPRING (Figure 26).	Adjust the contact spring so that it touches the contact stud on the blade controller when the blades are almost fully opened. It is possible to make the adjustment after removing the front lens element.

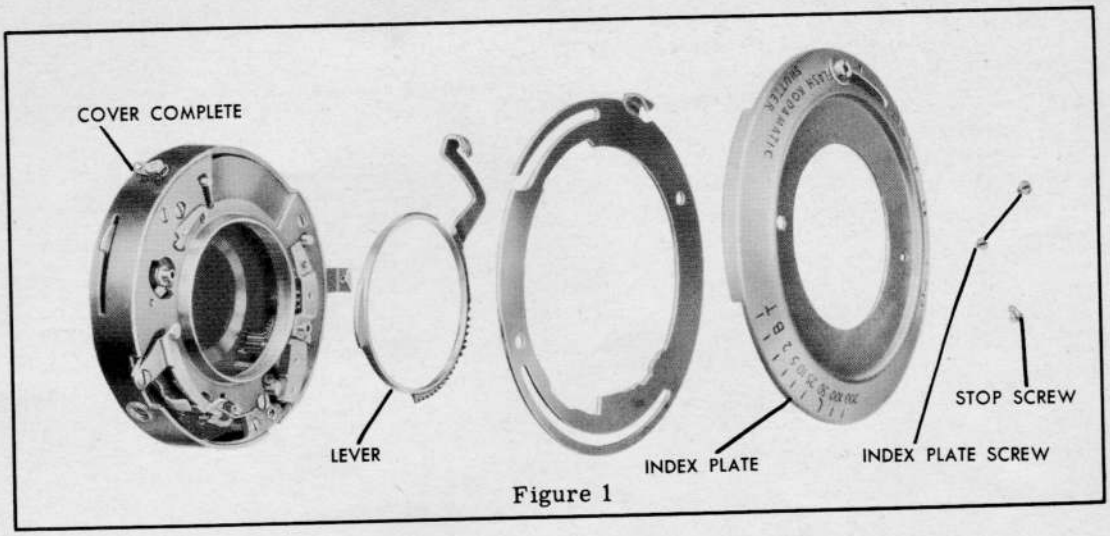


Figure 1

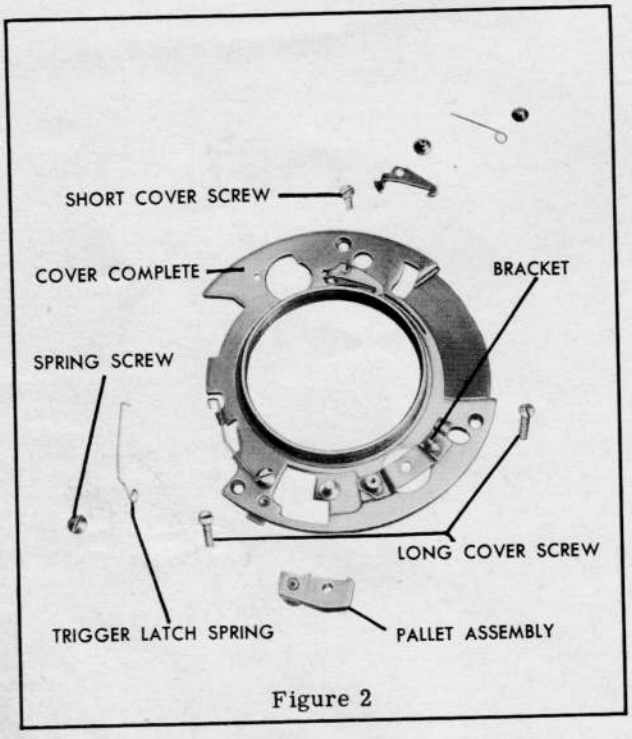


Figure 2

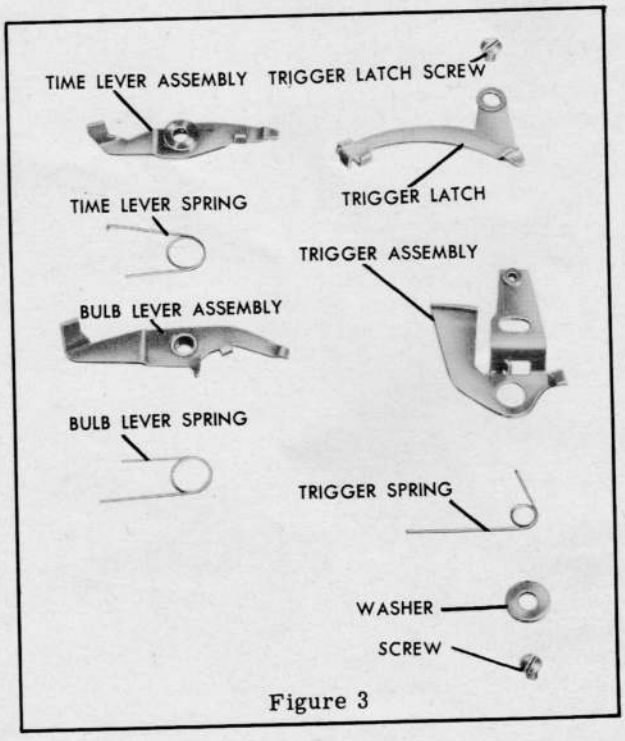


Figure 3

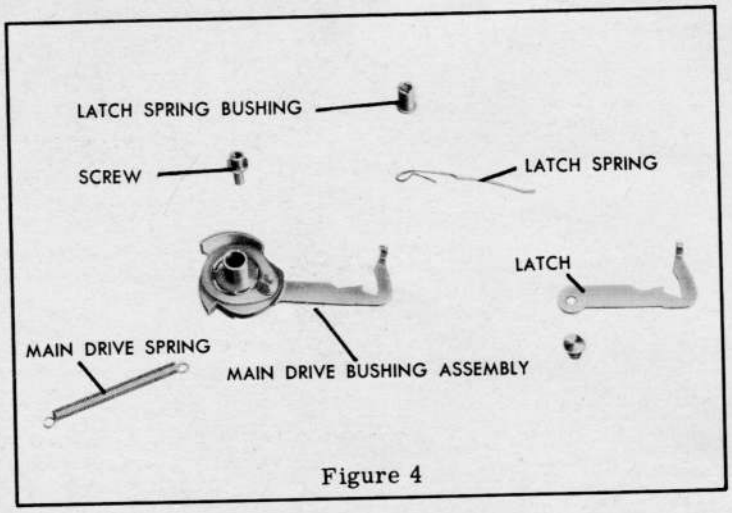


Figure 4

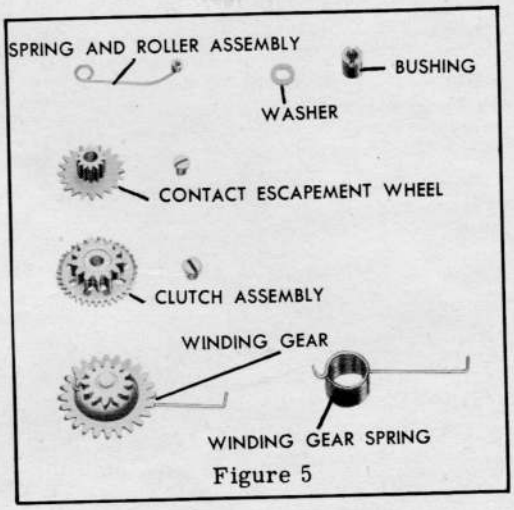


Figure 5

DISASSEMBLY

The shutter need not be removed from the camera unless there are repairs to be made below the MECHANISM PLATE (Figure 8). Insert tool No. 503K in the cable release socket to prevent the shutter from turning when pressure is applied on tool No. 503F to remove the front lens element from the shutter. Remove the rear lens element. Remove the finder lens front and rear elements.

PARTS ON FRONT OF SHUTTER

Remove the speed and diaphragm INDEX PLATE with synchronizer scale (Figure 1) by removing the two speed and diaphragm INDEX PLATE SCREWS. The speed control RING which is under the diaphragm plate will lift off with the plate.

CAUTION: If a minor repair is to be made and the shutter does not have to be disassembled below the COVER COMPLETE, care should be taken when removing the diaphragm plate and speed ring, not to disturb the winding LEVER. If the winding lever is moved, the flash timing will have to be adjusted.

Disengage and lift off the winding lever.

COVER COMPLETE AND ASSOCIATED PARTS

Unhook and remove the TRIGGER LATCH SPRING (Figure 2) by removing the trigger latch SPRING SCREW. Remove the TRIGGER LATCH SCREW (Figure 3) and lift off the TRIGGER LATCH. Lift off the flash retard PALLET ASSEMBLY (Figure 2). Remove the cover complete by removing the two LONG and one SHORT COVER SCREWS.

PARTS ON MECHANISM PLATE

Lift out the WINDING GEAR with pinion and spring assembly (Figure 5). Remove the retarding SECTOR SCREW (Figure 6) and lift off the retarding SECTOR WITH STUD and the retarding SECTOR SPRING. This is more easily accomplished with the shutter in a set position.

Trip the shutter, and unhook the long end of the blade controller LATCH SPRING (Figure 4). Remove the main drive SCREW. Unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD (Figure 11). Set the shutter and at the same time move the latch end of the blade controller LATCH (Figure 4) toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING and disk with blade controller latch ASSEMBLY.

Open the shutter blades by pushing the BLADE CONTROLLER LEVER (Figure 11). Then open the diaphragm retainer PLATE WITH WINGS ASSEMBLY (Figure 9). Remove the trigger SCREW (Fig. 3), the TRIGGER SPRING and the trigger WASHER.

Lift off the TRIGGER ASSEMBLY, the TIME LEVER ASSEMBLY, the TIME LEVER SPRING, the BULB LEVER ASSEMBLY, and the BULB LEVER SPRING. Remove the CLUTCH ASSEMBLY (Figure 5) and the CONTACT ESCAPEMENT WHEEL and pinion assembly by removing the retaining screws. Remove the blade controller LATCH SPRING BUSHING (Figure 4) and the blade controller latch spring.

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 6) and lift off the retard gear PLATE COMPLETE. Remove the remainder of the gear train as follows:

1. Retard GEAR WITH NO. 2 PINION assembly.
2. Retard GEAR WITH NO. 3 PINION assembly.
3. ESCAPEMENT WHEEL with No. 4 pinion assembly.
4. PALLET.
5. PALLET BRACKET assembly and the PALLET BRACKET SPRING.

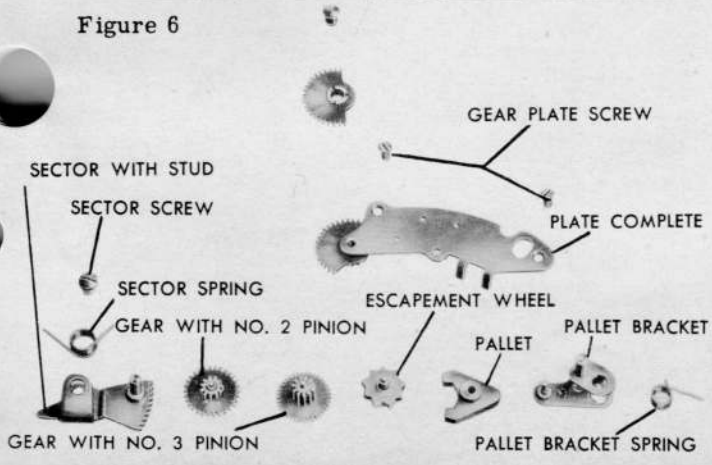
NOTE: If the retard gears are dirty causing the low speeds to be too slow, clean all the parts of the retard gear train in carbon tetrachloride and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

MECHANISM PLATE AND CONTACT POINTS

Starting with the end of the CONTACT SPRING (Figure 7) near the setting lever with stop stud, turn off the CONTACT SPRING screw nut using tool No.

Figure 6



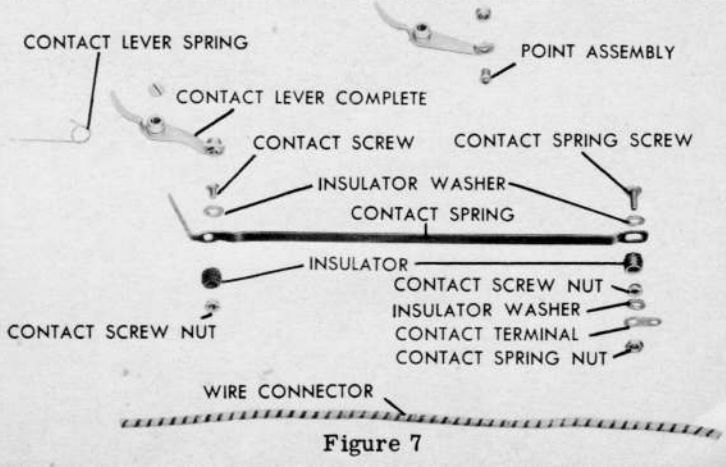


Figure 7

181. Remove the CONTACT TERMINAL and the case INSULATOR WASHER. Hold the CONTACT SPRING SCREW with tool No. 181, turn off the CONTACT SCREW NUT with tool No. 503L. Remove the contact spring screw, the case INSULATOR WASHER and the case INSULATOR.

Hold the CONTACT SCREW which holds the contact end of the CONTACT SPRING to the case with tool No. 503L, turn off the contact screw nut with tool No. 181. Remove the contact screw, the case INSULATOR WASHER, the case INSULATOR and the contact spring.

Remove the CONTACT LEVER COMPLETE and the CONTACT LEVER SPRING by removing the retaining screw. Remove the detent spring BUSHING (Figure 5), the detent spring WASHER and the detent SPRING AND ROLLER ASSEMBLY. Remove the four mechanism plate SCREWS (Figure 9).

Lift out the mechanism plate complete and the diaphragm retainer PLATE WITH WINGS ASSEMBLY (Figure 9). Unhook the setting lever SPRING (Figure 8) from the setting lever spring stud on the shutter case and remove the SETTING LEVER with stop stud.

Remove the diaphragm POINTER Remove the five diaphragm retainer plate SCREWS (Figure 9) and lift off the diaphragm retainer plate with wings assembly.

Lift out the six SHUTTER BLADES. Remove the BLADE CONTROLLER with contact stud.

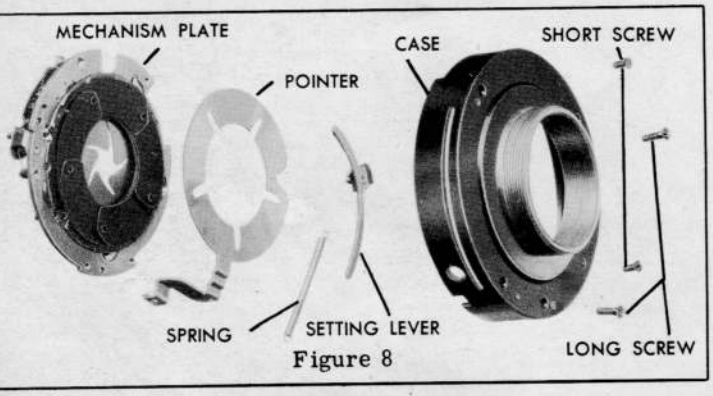


Figure 8

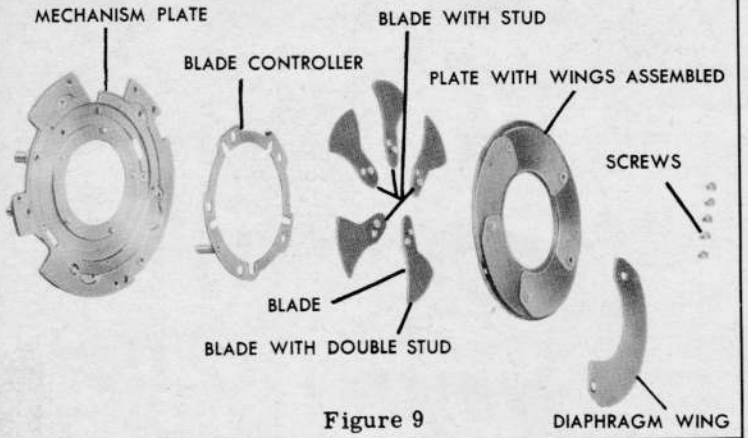


Figure 9

REPAIR

BLADE CONTROLLER LATCH (See figure 10)

If the shutter blades rebound and leave a small opening when closing, the blade controller latch on the MAIN DRIVE BUSHING with disk and blade controller latch ASSEMBLY (Figure 4) is not properly holding the BLADE CONTROLLER LEVER (Figure 11).

Reshape the latch at point A (Figure 10) to hold the blade controller lever tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The blade controller lever should fit into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed slightly at point C.

BULB LEVER

If the shutter works instantaneously when set on B (bulb) the tension on the BULB LEVER SPRING (Figure 3) may be weak. Increase the tension on the spring by bending the long bent end toward the case.

Failure of the shutter to operate properly on B may also be caused by improper adjustment of the lug on the side of the trigger. If the lug is bent too far toward the main drive, it will prevent the end of the BULB LEVER ASSEMBLY from stopping the disk on the main drive bushing and disk with blade controller latch assembly, because the bulb lever assembly will not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever toward the disk.

SPEED CONTROL RING TENSION

If the speed control RING (Figure 1) is loose, the tension on the ring can be increased by bending the side of the speed control ring tension spring so that the ring will fit tighter in the speed and diaphragm index plate with synchronizer scale.

ADJUSTING SHUTTER SPEEDS

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the 1/2 second with a stop watch and judge the other speeds as well as possible with a shutter known to be in good adjustment.

1. If the 1/2 second is slow and all the speeds are slow, the MAIN DRIVE SPRING (Figure 4) has lost some of its tension and should be replaced. Also check to make sure that the shutter blades are not binding.

2. If the 1/2 second and the remaining low speeds are slow, but the high speeds appear to be correct,

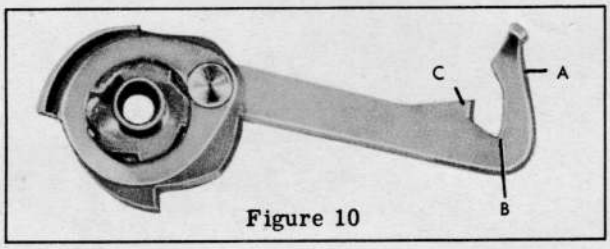


Figure 10

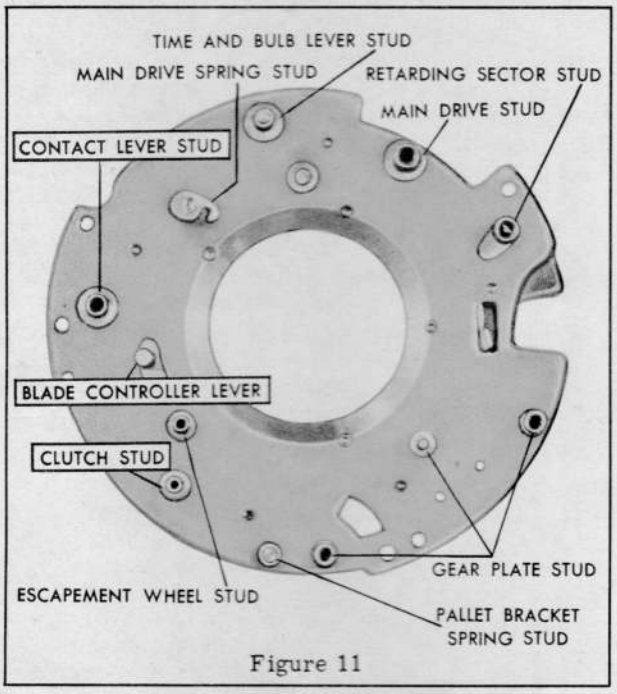


Figure 11

the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1/2 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 6) may be incorrectly meshed so that a full motion of the retard gear train is not obtained.

Uneven shutter speeds (for example, 25, 50, and 200 are correct but 100 is fast or slow) can be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the speed control ring at the proper point. Filing slows the speeds while swedging increases the speeds.

REASSEMBLY

RETARD GEAR TRAIN

Place the PALLET BRACKET SPRING (Figure 6) inside the PALLET BRACKET assembly with the long end of the spring at the top and facing the edge of the MECHANISM PLATE complete (Figure 9) and place them over the pallet bracket stud. Fit the PALLET (Figure 6) over the stud on the pallet bracket assembly. Replace the ESCAPEMENT WHEEL with No. 4 pinion assembly, the retard GEAR WITH NO. 3 PINION assembly and the retard GEAR WITH NO. 2 PINION assembly.

Replace the retard gear PLATE COMPLETE and fasten it with the two retard GEAR PLATE SCREWS. Place the long end of the pallet bracket spring against the inner edge of the PALLET BRACKET SPRING STUD (Figure 11).

MECHANISM PLATE AND CONTACT POINTS

Replace the blade controller, fitting the BLADE CONTROLLER LEVER (Figure 11) through the small opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Hold the blade carefully to avoid bending, and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.

With the blade controller lever turned as far as possible toward the retard gear train, replace the BLADE WITH DOUBLE BLADE STUD assembly (Figure 9) with the hole in the blade over the stud on the back of the mechanism plate near the blade controller lever. The stud on the blade must be turned up, and the bushing on the other side of the blade must fit into the cutout slot on the inner edge of the blade controller. Proceeding counterclockwise replace a BLADE WITH STUD assembly allowing the wide end of the blade to overlap the narrow end of the first blade.

Replace the remaining three blades with stud assembly allowing the wide end of each blade to overlap the narrow end of the preceding blade. Replace the remaining BLADE over the blade with double blade stud assembly. The back of the mechanism plate should appear as shown in figure 12.

Replace the diaphragm retainer PLATE WITH WINGS ASSEMBLY (Figure 9) by lining up the cutout slot in the outer edge of the retainer plate with the stud on the pallet bracket assembly. Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate SCREWS. The shutter blades must operate freely at this point.

With the top of the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the sides of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom blade. This is done to prevent the shutter blades from splitting. Care should be taken not to bend the blades too much or they will bind when fully opened.

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around in the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

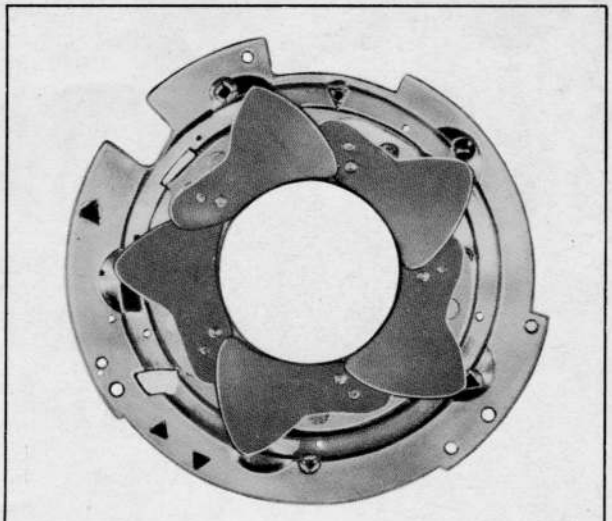


Figure 12

Insert the diaphragm POINTER (Figure 8) into the largest slot in the side of the shutter case with the pointer facing up. Move the pointer as close as possible to the setting lever spring stud in the bottom of the case.

Place the SETTING LEVER with stop stud in the shutter case with the protruding end extending through the smaller slot in the case. Then push the setting lever toward the cable release bushing.

Insert the case INSULATOR (Figure 7) into the opening above the large slot in the shutter case with the collar end of the insulator facing out. Place a case INSULATOR WASHER over the opening on the inside of the shutter case. Position the CONTACT SPRING against the washer and insert the CONTACT SCREW into the opening in the spring and washer. Fasten the screw with the CONTACT SCREW NUT, using tool No. 503L, while holding the screw in position with tool No. 262.

Insert the remaining case insulator through the hole in the shutter case near the RETARDING SECTOR STUD (Figure 11) with the collar side of the insulator facing out. Place a case insulator washer over the opening on the inside of the case. Position the contact spring against the washer and insert the contact screw through the hole in the contact spring. Fasten the screw with the contact screw nut using tool No. 503L; hold the screw in position with tool No. 181. Place a case insulator washer on the protruding end of the contact screw. Place the CONTACT TERMINAL (Figure 7) over the washer and fasten it with the contact SPRING SCREW NUT using tool No. 181.

NOTE: Whenever a contact screw and nut are reassembled to a shutter case, it is necessary that an insulating seal be applied to the contact screw nut to prevent moisture or foreign objects from grounding the flash circuit to the shutter case. Black Glyptol (quick drying) is recommended as a good insulating material. This must be applied to the contact nut carefully to insure a continuous coating.

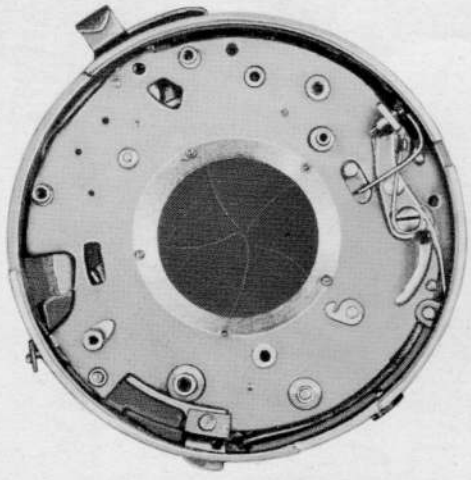


Figure 13

Hold the mechanism plate with the retard gear train up and line up the screw hole on the edge of the mechanism plate near the retarding sector with the corresponding hole in the case. Slip the mechanism plate into the case under the contact end of the contact spring. Hold the mechanism plate in position and replace the long mechanism plate SCREW. See that the circular projections on the ends of the diaphragm wings are in position in the slots in the diaphragm pointer.

The diaphragm wings should now operate properly. The setting lever with stop stud should move freely. Replace the two short mechanism plate SCREWS, and the remaining long mechanism plate screw. The shutter should appear as shown in (Figure 13.

PARTS ON MECHANISM PLATE

Place the blade controller LATCH SPRING (Figure 4) with the short end of the spring against the retarding sector stud and the spring loop over the threaded end of the long mechanism plate screw. Screw the blade controller LATCH SPRING BUSHING loosely on the screw. Hold the long end of the spring tightly against the inside wall of the case and tighten the bushing so that it holds the spring in place with tension toward the case. Secure the loose end of the setting lever SPRING (Figure 8).

With the BULB LEVER SPRING (Figure 3) underneath, hold the TRIGGER ASSEMBLY with the oval hole up and insert the BULB LEVER ASSEMBLY into the opening on the trigger. Then place the TIME LEVER ASSEMBLY and the TIME LEVER SPRING over the top of the bulb lever assembly with the spring facing up. Then grasp all three parts by inserting one prong of a pair of tweezers down through the center of the holes. With the long ends of the time and bulb lever springs turned in a clockwise direction and the short ends resting against the lugs on the levers, guide the parts down over the TIME AND BULB LEVER STUD (Figure 11). The long ends of the springs should rest against the shutter case.

Place the trigger WASHER (Figure 3) over the round hole in the base of the trigger. Hold the trigger spring over the washer with the short end pointing toward the contact stud on the blade controller. Replace the trigger SCREW. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD (Figure 11) and rest it against the stud.

Hold the MAIN DRIVE BUSHING and disk with blade controller latch ASSEMBLY (Figure 4), with the latch pointing toward the central opening in the mechanism plate, and fit the bushing down over the MAIN DRIVE STUD (Figure 11). Then, grasp the assembly and lift it up enough to fit the stud on the setting lever with stop stud into the slot in the main drive bushing.

Close the shutter blades. Push the blade controller latch toward the blade controller lever and set the shutter. The cutout portion of the latch will come to rest around the blade controller lever. Lift up the long end of the blade controller LATCH SPRING (Figure 4) and place it inside the vertical lug on the tip of the latch. Replace the main drive SCREW. Trip the shutter. Attach the MAIN DRIVE SPRING to the main drive spring stud.

Set the shutter, and with the long end of the retarding SECTOR SPRING (Figure 6) at the top replace the retarding SECTOR WITH STUD together with the retarding sector spring on the retarding sector stud. Fasten both parts with the retarding SECTOR SCREW. Lift up the long end of the retarding sector spring and place it against the inner side of the blade controller latch spring bushing.

Loosen slightly the two retard GEAR PLATE SCREWS. Then, lift up the pinion end of the gear plate until the teeth of the retarding sector with stud can pass freely under the pinion, and place the retarding sector with the outer edge approximately 1/32 inch away from the case. Still lifting up on the gear plate, turn the gear so that the last tooth before the cutout portion (proceeding clockwise) is up against the stud on the retarding sector. Engage the retarding sector with the pinion in this position by allowing the pinion end of the gear plate to drop down. If the retarding sector does not become engaged, follow through the procedure again, this time placing the outer edge of the retarding sector a little farther from the case. The retarding sector should be engaged in such a position that it is as close as possible to the case. Tighten the two retard gear plate screws.

Replace the CONTACT ESCAPEMENT WHEEL and pinion assembly (Figure 5) and secure it with the retaining screw. Replace the CLUTCH ASSEMBLY and fasten it with the retaining screw. The top gear on the clutch assembly should only turn freely in a clockwise direction when the lower gear is held tight. Replace the WINDING GEAR with pinion and spring assembly. Place the spring beneath the contact escapement wheel and pinion assembly, and against the stud of the clutch assembly.

Fit the detent SPRING AND ROLLER ASSEMBLY over the mechanism plate SCREW (Figure 8). The roller held end of the spring should be next to the mechanism plate with the roller facing up. Place the detent spring WASHER (Figure 5) over the spring. Place the roller between two teeth of the escapement wheel and fasten the spring with the detent spring BUSHING. Do not exert too much pressure against the escapement wehel as the bushing is tightened.

Fit the contact LEVER COMPLETE (Figure 7) over the CONTACT LEVER STUD (Figure 11). The lever is slipped under the contact spring and lifted up until it can be slipped over the contact stud. Replace the contact LEVER SPRING (Figure 7). The hooked end fits around the contact arm bushing and the long end rests against the shutter case. Replace the CONTACT LEVER SCREW.

> CAUTION: The end of the contact lever assembly which rides against the TRIGGER LATCH (Figure 3) must be highly burnished. Care should be taken at all times against touching this surface during adjustments.

Set the shutter. Then release the shutter and at the same time retard its opening action by placing one finger against the setting lever. Allow the shutter to release slowly at the same time observing whether the contact stud on the blade controller makes slight contact with the contact spring when the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.

Check the fall of the point on the contact lever complete as it falls between the teeth of the contact escapement wheel and pinion assembly. The roller on the end of the detent spring and roller assembly should be between the teeth of the escapement wheel at the same time as the contact lever. If it does not, the spring can be shortened or lengthened by pulling it forward or pushing it back. When the contact lever is between the teeth there should be a minimum of play in the escapement wheel. This adjustment will insure against the point of the contact resting on the top of the escapement wheel after the shutter has been set. If it did, the winding LEVER (Figure 1) would not lock into position when pulled down.

The contact spring should not be touching the contact lever. Be sure it is not raised too high so that it will touch the cover when it is replaced.

COVER COMPLETE AND ASSOCIATED PARTS

Replace the COVER COMPLETE (Figure 2) fitting the shaft on the winding gear with pinion and spring assembly into the hole in the winding gear pinion BRACKET. Fasten the cover with the two LONG and one SHORT COVER SCREWS.

Set the shutter and replace the trigger latch with the long bent end of the latch contacting the inner edge of the contact lever complete and attach it with the TRIGGER LATCH SCREW (Figure 3).

Replace the TRIGGER LATCH SPRING (Figure 2) by holding the hooked end of the spring approximately halfway between the latch and the lens opening on the cover, and fastening it with the trigger latch SPRING SCREW. Hook the end of the spring over the outer edge of the trigger latch. The latch should be burnished at the point of spring contact.

PARTS ON FRONT OF SHUTTER

Replace the winding lever with the sixth or seventh tooth from the left meshed with the WINDING GEAR with pinion and spring assembly (Figure 5). Place the winding gear spring in tension by giving two and one-half strokes on the winding lever, lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

> CAUTION: In lifting the winding lever between strokes, be careful not to touch the trigger latch because it will move out toward the shutter case and touch the contact lever complete which in turn will release the tension on the winding gear spring.

Trip the shutter and lightly hold the winding lever down around the central collar on the cover complete at a point near the trigger latch. As the shutter is tripped the end of the latch should fall into the slot on the cover complete. If it does not fall into the slot add more tension to the trigger latch spring. The winding lever should contact the trigger latch, push the latch out of the slot in the cover and open the shutter blades. After the shutter blades have been tripped, the trigger latch should return to a position with the latch resting on the ledge just above the small slot in the cover complete.

At this point the end of the contact lever complete should be firmly seated between the teeth of the contact escapement wheel and pinion assembly. This will insure that when the shutter is again set and the winding lever is pulled down, it will stay down.

If the contact lever assembly is not seated properly in the escapement wheel, the end of the arm on the contact lever which the latch rides against can be formed in very slightly towards the shutter blades. The latch should not be bent.

Check for trigger contact. As the trigger latch is forced down, it will release the pointed end of the contact lever complete from the contact escapement wheel and pinion assembly, but the contact point assemblies should not make contact. They should be as close as possible without making contact.

After the trigger is pushed down, allow it to return to its proper position very slowly. If there should be too much tension on the trigger latch spring, it will tend to retard the action of the latch. This is also true if there is too much tension between the trigger latch and the contact lever. In a properly fitted contact lever and latch, play between the two should be at a minimum. Place the flash retard PALLET ASSEMBLY (Figure 2) on the PALLET ASSEMBLY STUD (Figure 11).

NOTE: Be sure that the pallet stud is tight on the cover. If any adjustment is made on the stud it should be anchored securely in position. Set the shutter.

Pull down the winding lever slowly and see that the pallet falls into every tooth of the winding lever. If it does not, turn the eccentric post until the pallet is closer to the winding lever using special tool No. 657.

Assemble the speed CONTROL RING (Figure 1) and the speed and diaphragm INDEX PLATE with synchronizer scale. Place the diaphragm pointer (Figure 8) at f/22, and the speed control ring pointer between the 1/2 and 1/5 of a second speed indication.

Place the speed control ring and the diaphragm index plate on the shutter. Push them to the left as far as they will go guiding them under the diaphragm pointer. Place a slight downward pressure on the speed control ring and diaphragm index plate and bring them back over to the right until a click is heard and the screw holes are centered. Bring the speed pointer down to T (Time). Replace the BOTTOM speed and diaphragm INDEX PLATE SCREW (Figure 1) and the TOP speed and diaphragm INDEX PLATE SCREW. Replace the front and rear lens elements.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter very slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open before the winding lever opens them. If this occurs refer to the Trouble Chart.

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

F	(short stroke)	3 — 5 milleseconds.
M	(long stroke)	12 — 16 milleseconds.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
No Kodatron contact	The contact stud on the BLADE CONTROLLER with contact stud (Figure 9) is not touching the CONTACT SPRING (Figure 7).	Adjust the contact spring so that it touches the stud on the blade controller as the shutter blades are almost fully opened. It is possible to make this adjustment after removing the front lens elements.
The winding lever does not hold when set	The clutch assembly is slipping.	Replace the clutch assembly.
	The contact lever may not be seated properly in the escapement wheel.	Adjust the arm of the contact lever where it rides on the trigger latch. If the arm is moved in slightly toward the latch, the point on the contact arm will lock more securely in the escapement wheel.
	The teeth on the escapement wheel may be burred.	Replace the escapement wheel.
	The point of the contact arm may not be falling into the escapement wheel properly.	Adjust the detent spring so that when the point of the contact arm falls into the escapement wheel there is a minimum of movement in the gear and no danger of the point resting on a point of the gear.
Shutter speeds slow	Retard gears dirty.	Remove and clean the retard gears.
	The MAIN DRIVE SPRING (Figure 4) weak.	Fit new main drive spring.
	Shutter blades are binding.	Remove and clean, or replace the shutter blades.
Shutter operates instantaneously on B (Bulb)	Tension is weak on the BULB LEVER SPRING (Figure 3).	See page 28.
	The lug on the side of the rectangular opening in the TRIGGER is out of adjustment.	See page 28.
Shutter does not operate on T, (Time)	Time lever ASSEMBLY (Figure 3) binding.	Refit the time lever and add slight tension to TIME LEVER SPRING (Figure 3).
Unable to set the shutter	The trigger latch is not returning to its proper position after the shutter has been released.	Check the tension on the TRIGGER SPRING (Figure 3). It may be necessary to add tension. The trigger latch may be bent and binding on the diaphragm INDEX PLATE (Figure 1). The tension may be too great on the trigger latch. The tension between the CONTACT LEVER COMPLETE point of detent gear (Figure 3) and the trigger latch may be too great.

TROUBLE	CAUSE	REMEDY
Shutter blades stay open	Split shutter blades.	Replace shutter blades.
	Loose studs on shutter blades.	Replace shutter blades.
	The blade controller LATCH (Figure 7) is loose on the MAIN DRIVE BUSHING (Figure 4).	Remove the latch from the lever on the blade controller. Tighten the blade controller latch stud. Bend the straight end of the latch spring downward so it will hold the latch against the mechanism plate more securely.
Shutter blades rebound	Blade controller latch does not fit properly.	See page 28.
Both flash settings are below the millesecond tolerances (fast)	The tension is too great on the WINDING GEAR SPRING (Figure 5).	Relieve the tension slightly on the winding gear spring.
Both flash settings are above the millesecond tolerances (slow)	There is not enough tension on the winding gear spring.	Place the winding gear under slightly greater tension. Care should be taken during this adjustment not to disturb the TRIGGER LATCH (Figure 3).
	The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE (Figure 1).	The index plate will be marked at the binding point. The plate can be filed slightly to allow clearance. The inner surfaces of the winding lever should be burnished and the cover checked for burrs. Be sure the winding lever is not bent.
The F (short stroke) is within the millesecond tolerances but the M (long stroke) is fast	The flash retard PALLET ASSEMBLY (Figure 2), is not meshing properly with the winding lever.	With special tool No. 657 turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. After making this adjustment make certain that the stud is tight on the cover.
Constant flash short	The contact POINT ASSEMBLY (Figure 7) has become disassembled.	Replace the contact point assembly.
	The contact spring (Figure 7) may be bent and touching either the contact lever or the cover.	Reform the contact spring.
Both flash settings are extremely fast or below the millesecond tolerances	The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon.	Add more tension to the trigger latch spring.
	The end of the trigger latch is bent back towards the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades.	Reform the end of the trigger latch by bending it slightly towards the winding gear.

DISASSEMBLY

PARTS ON FRONT OF SHUTTER

Remove the front and rear lens elements. Remove the diaphragm pointer TIP and screw and the diaphragm pointer STOP SCREW. Lift off the speed and diaphragm INDEX PLATE with synchronizer scale (Figure 14) and the speed control RING.

CAUTION: If a minor repair is to be made and the shutter does not have to be disassembled below the COVER COMPLETE (Figure 2), care should be taken when removing the speed control ring, not to disturb the winding LEVER (Figure 14). If the winding lever is moved, the flash timing will have to be adjusted.

Disengage and lift off the winding lever.

COVER COMPLETE AND ASSOCIATED PARTS

Unhook and remove the TRIGGER LATCH SPRING (Figure 2) by removing the trigger latch SPRING SCREW. Remove the TRIGGER LATCH (Figure 15) by removing the trigger latch BUTTON SCREW and BUTTON. Lift out the flash retard PALLET ASSEMBLY (Figure 2). Remove the cover complete by removing the two LONG and one SHORT COVER SCREWS.

PARTS ON MECHANISM PLATE

Lift out the WINDING GEAR with pinion and spring assembly (Figure 5). Remove the retarding SECTOR SCREW (Figure 17) and lift off the retarding sector with stud and the retarding SECTOR SPRING. This is more easily accomplished with the shutter in a set position. Trip the shutter, and unhook the long end of the blade controller LATCH SPRING (Figure 16). Remove the main drive SCREW.

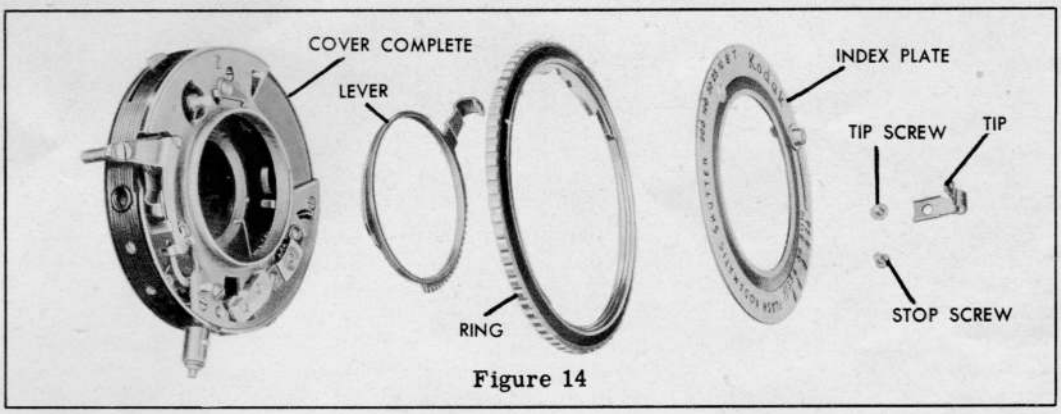


Figure 14

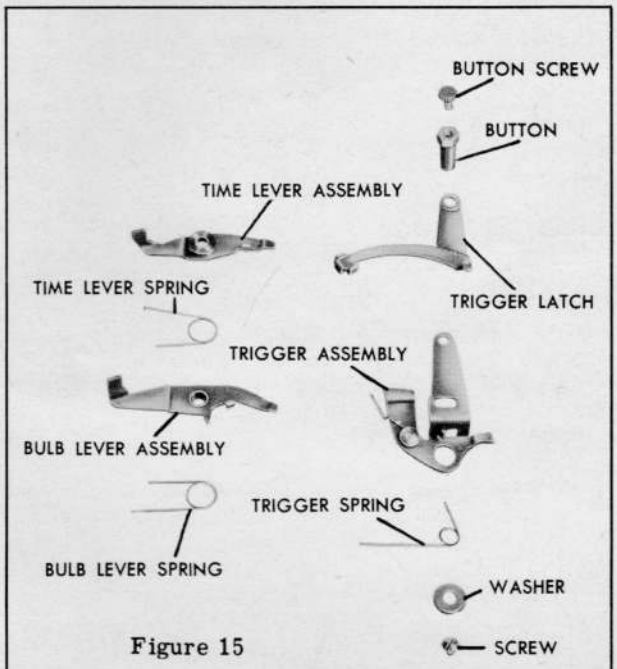


Figure 15

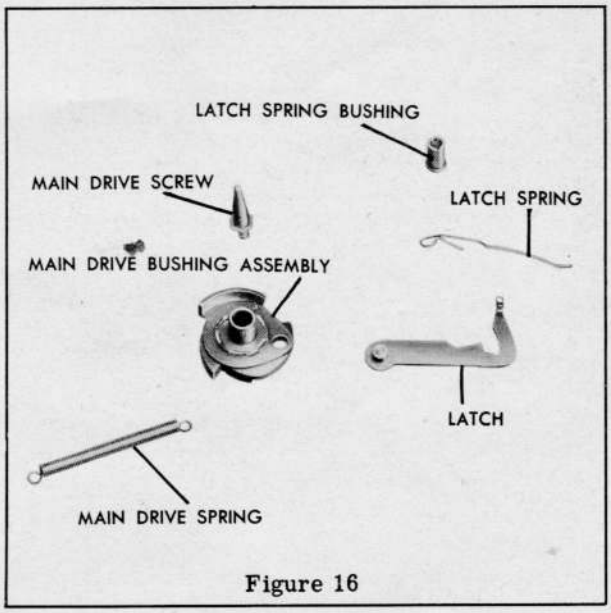


Figure 16

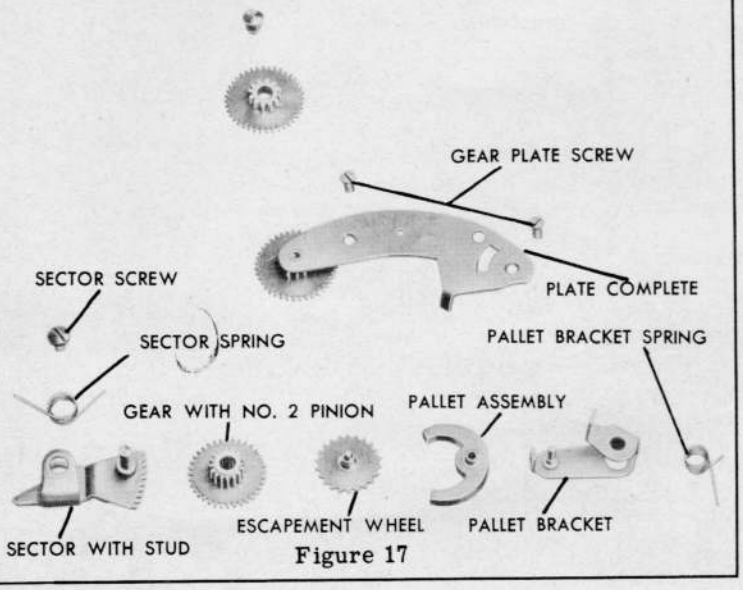


Figure 17

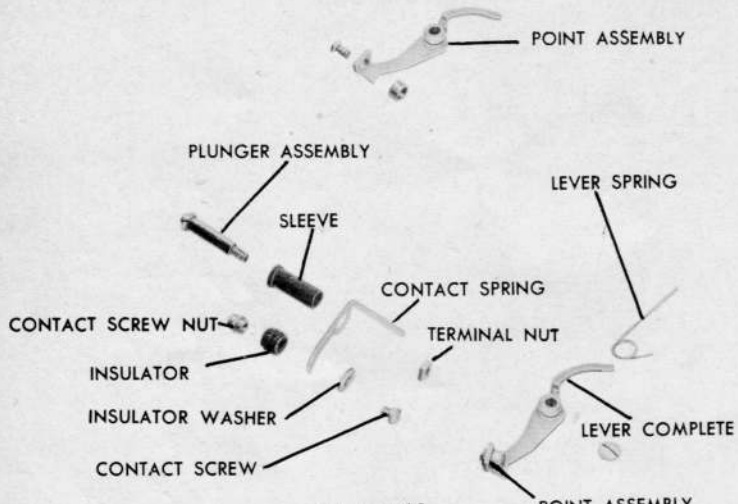


Figure 18

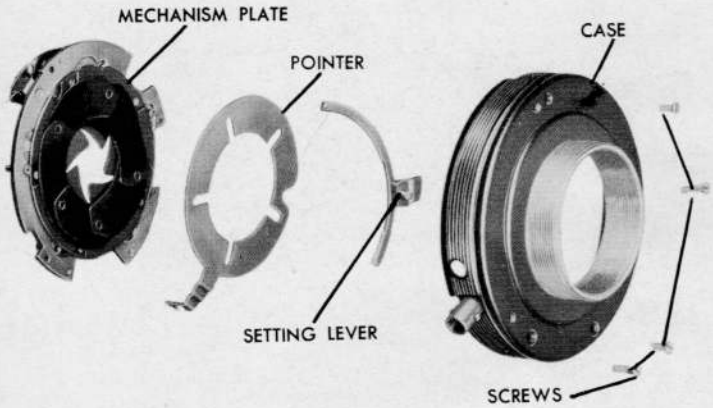


Figure 19

Unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD (Figure 20). Set the shutter and at the same time move the end of the blade controller LATCH with stud assembly (Figure 16) toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING with DISK ASSEMBLY. Remove the blade controller latch with stud assembly.

Open the shutter blades by pushing the BLADE CONTROLLER LEVER (Figure 20). Then open the diaphragm wings. Remove the trigger SCREW (Figure 15), the trigger SPRING, and the trigger WASHER. Lift out the TRIGGER ASSEMBLY, the TIME LEVER ASSEMBLY, the TIME LEVER SPRING, the BULB LEVER ASSEMBLY, and the BULB LEVER SPRING.

Remove the CLUTCH ASSEMBLY (Figure 5) by removing the retaining screw. Remove the CONTACT ESCAPEMENT WHEEL and pinion assembly by removing the holding screw. Remove the blade controller LATCH SPRING BUSHING (Figure 16) and the blade controller latch spring.

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 17) and lift off the retard gear PLATE COMPLETE. Remove the remainder of the gear train as follows:

1. Retard GEAR WITH NO. 2 PINION assembly.
2. ESCAPEMENT WHEEL with No. 3 pinion assembly.
3. PALLET ASSEMBLY.
4. PALLET BRACKET assembly and the PALLET BRACKET SPRING.

NOTE: If the retard gears are dirty causing the low speeds to be too slow, clean all the parts of the retard gear train in carbon tetrachloride, and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

MECHANISM PLATE AND CONTACT POINTS

With tool No. 503J remove the TERMINAL NUT (Figure 18) on the PLUNGER ASSEMBLY end of the CONTACT SPRING. Remove the case INSULATOR WASHER, the plunger assembly and the terminal body insulating SLEEVE. At the point where the contact lever complete touches the contact spring, remove the CONTACT SCREW NUT using tool No. 503K. Remove the CONTACT SCREW, the case INSULATOR WASHER and the case INSULATOR. Remove the contact LEVER COMPLETE and the contact LEVER SPRING by removing the retaining screw.

Remove the detent SPRING AND ROLLER ASSEMBLY (Figure 5) by removing the detent spring BUSHING and the detent spring washer. Turn the shutter over and remove the two long and two short mechanism plate SCREWS (Figure 19).

Lift out the MECHANISM PLATE complete (Figure 9), and the diaphragm retainer PLATE WITH WINGS ASSEMBLY. Remove the diaphragm POINTER (Figure 19). Remove the five diaphragm retainer

plate SCREWS (Figure 9) and lift off the retainer plate. Lift out the six SHUTTER BLADES. Remove the BLADE CONTROLLER with contact stud. Lift out the SETTING LEVER with stop sutd (Figure 19).

REPAIR

BLADE CONTROLLER LATCH (See figure 10)

If the shutter blades rebound and leave a small opening when closing, the blade controller LATCH WITH STUD ASSEMBLY (Figure 16) is not properly holding the BLADE CONTROLLER LEVER (Figure 20).

Reshape the LATCH at point A (Figure 10) to hold the lever of the blade controller tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The lever on the blade controller should fit freely into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed slightly at point C.

BULB LEVER

If the shutter works instantaneously when set on B (Bulb), the tension on the BULB LEVER SPRING (Figure 15) may be weak. Increase the tension on the spring by bending the long bent end towards the shutter case. If necessary replace the spring.

Failure of the shutter to operate properly on B may also be caused by improper adjustment of the lug on the side of the trigger. If the lug is bent too far toward the main drive, it will prevent the bulb lever from stopping the disk on the MAIN DRIVE BUSHING and disk ASSEMBLY (Figure 16), because the bulb lever will not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever toward the disk.

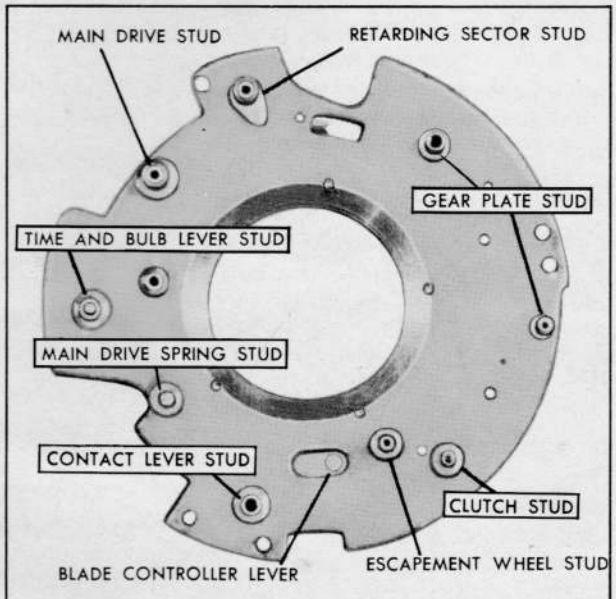


Figure 20

ADJUSTING SHUTTER SPEEDS

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the speeds as well as possible with a shutter known to be in good adjustment.

1. If the 1/10 second is slow and all the speeds are slow, the main drive spring has lost some of its tension and should be replaced. Also check to see that the shutter blades are not binding.

2. If the 1/10 second and the remaining low speeds are slow, but the high speeds appear to be correct, the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1/10 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 17) may be incorrectly meshed so that a full motion of the retard gear train is not obtained.

Uneven shutter speeds (for example, 25, 50, and 200 are correct but 100 is fast or slow) should be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the speed control ring at the proper point. Filing slows the speed while swedging speeds it up.

REASSEMBLY

RETARD GEAR TRAIN

Place the PALLET BRACKET SPRING (Figure 17) inside the PALLET BRACKET assembly with the long end of the spring at the top and facing the edge of the MECHANISM PLATE complete (Figure 9) and place them over the pallet bracket stud. Fit the PALLET ASSEMBLY (Figure 17) over the stud on the pallet bracket assembly. Replace the ESCAPEMENT WHEEL with No. 3 pinion assembly and the retard GEAR WITH NO. 2 PINION assembly.

Replace the retard gear PLATE COMPLETE and fasten it with the two retard GEAR PLATE SCREWS. Place the long end of the pallet bracket spring against the protruding lip on the retard gear plate.

MECHANISM PLATE AND CONTACT POINTS

Replace the blade controller, fitting the BLADE CONTROLLER LEVER (Figure 20) through the small opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Hold the blades carefully to avoid bending, and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.

With the blade controller lever as close as possible to the pallet bracket assembly, replace the BLADE WITH DOUBLE BLADE STUD assembly (Figure 9), with the hole in the blade over the stud on the back of the mechanism plate near the blade controller lever. The stud on the blade must be turned up, and the bushing on the other side of the blade must fit into the cutout slot on the inner edge of the blade controller. Proceeding counterclockwise replace a blade with stud assembly allowing the wide end of the blade to overlap the narrow end of the first blade.

Replace the remaining three blades with stud assembly allowing the wide end of each blade to overlap the narrow end of the preceding blade.

Place the remaining BLADE over the blade with double blade stud assembly, fitting one hole in the blade over the stud on the mechanism plate and the other hole over the stud on the blade with double blade stud assembly. When this has been done the back of the mechanism plate should appear as shown in figure 12.

Replace the diaphragm retainer plate with wing assembly by lining up the cutout slot in the outer edge of the retainer plate with the stud on the pallet bracket assembly. Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate SCREWS. With the top of the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the side of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom shutter blade. This is done to prevent the shutter blades splitting. Care should be taken not to bend the blades too much or they will bind when fully open.

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around in the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

Insert the diaphragm POINTER (Figure 19) in the large slot in the side of the shutter case with the pointer facing up. Move the pointer as close as possible to the retard gear train.

Place the SETTING LEVER with stop stud in the shutter case with the protruding end extending through the smaller slot in the shutter case. Then push the setting lever toward the cable release bushing.

Insert the threaded end of the plunger assembly in the collar end of the terminal body insulating SLEEVE (Figure 18). Then insert the assembled parts in the TERMINAL BODY. Position the opening in the contact spring nearest the contact end of the spring over the corresponding hole into which the plunger assembly is inserted. Push the threaded end of the plunger assembly through the opening in the spring. Place the case INSULATOR WASHER on the end of the plunger assembly and fasten the plunger with the terminal nut.

Insert the case INSULATOR in the hole in the side of the case near the CLUTCH STUD (Figure 20) with the collar end of the insulator facing out. Replace the case INSULATOR WASHER (Figure 18) over the opening on the inside of the shutter case. Position the end of the spring against the washer and insert the contact screw in the opening in the spring. Fasten the screw with the CONTACT SCREW NUT, using tool No. 503L while holding the screw in position with tool No. 262.

NOTE: Whenever a contact screw and nut are reassembled to a shutter case, it is necessary that an insulating seal be applied to the contact screw nut to prevent moisture or foreign objects from grounding the flash circuit to the shutter case. Black Glyptol (quick drying) is recommended as a good insulating material. This must be applied to the contact nut carefully to insure a continuous coating.

Hold the mechanism plate with the retard gear train up and line up the screw hole on the edge of the mechanism plate, near the retarding sector with the corresponding hole in the case. Slip the mechanism plate into the case under the contact end of the contact spring. Hold the mechanism plate in position and turn the case and plate over. Replace the two long and two short mechanism plate SCREWS. The shutter should appear as shown in Figure 21.

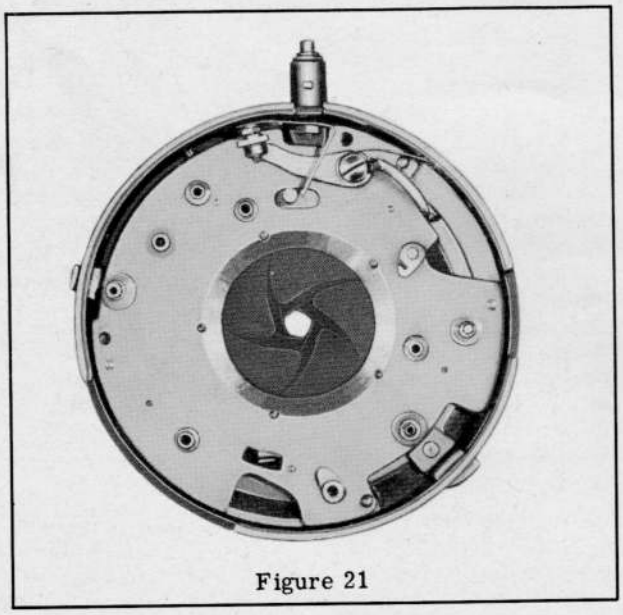


Figure 21

PARTS ON MECHANISM PLATE

Place the blade controller LATCH SPRING (Figure 16) with the short end of the spring against the RETARDING SECTOR STUD (Figure 20) and the spring loop over the threaded end of the long mechanism plate screw. Screw the blade controller LATCH SPRING BUSHING (Figure 16) loosely on the screw. Hold the long end of the spring tightly against the inside wall of the case and tighten the bushing so that it holds the spring in place with tension toward the case.

With the BULB LEVER SPRING (Figure 15) underneath, hold the TRIGGER ASSEMBLY with the oval hole up and insert the BULB LEVER ASSEMBLY in the opening on the trigger. Then place the TIME LEVER ASSEMBLY and the TIME LEVER SPRING over the top of the bulb lever assembly with the spring facing up. Then grasp all three parts by inserting one prong of a pair of tweezers down through the center of the holes. With the longer ends of the time and bulb lever springs turned in a clockwise direction and the shorter ends resting against the lugs on the levers, guide the parts down over the TIME AND BULB LEVER STUD (Figure 20). The long ends of the springs should rest against the shutter case.

Place the trigger WASHER over the round hole in the base of the trigger. Hold the TRIGGER SPRING over the washer with the short end pointing toward the contact stud on the blade controller. Replace the trigger SCREW. Lift the long end of the

spring over the top of the MAIN DRIVE SPRING STUD (Figure 20) and rest it against the stud.

With the MAIN DRIVE SPRING (Figure 16) hooked in the small hole in the disk on the MAIN DRIVE BUSHING with disk assembly, insert the stud on the latch in the small opening on the disk. Hold the assembly with the latch pointing toward the central opening in the mechanism plate, and fit the bushing down over the MAIN DRIVE STUD (Figure 20).

Close the shutter blades. Push the latch toward the lever on the blade controller, and set the shutter by pushing the setting lever clockwise. The cutout portion of the latch will come to rest around the lever on the blade controller. Lift up the long end of the blade controller latch spring and place it inside the vertical lug on the tip of the latch.

Replace the main drive SCREW. Trip the shutter and attach the MAIN DRIVE SPRING to the main drive spring stud. Set the shutter and with the long end of the retarding SECTOR SPRING (Figure 17) at the top, replace the retarding SECTOR WITH STUD and the retarding sector spring on the RETARDING SECTOR STUD (Figure 20). Fasten both parts with the retarding SECTOR SCREW (Figure 17). Lift up the long end of the retarding sector spring and place it against the inner side of the blade controller LATCH SPRING BUSHING (Figure 16)

Loosen slightly the two retard GEAR PLATE SCREWS (Figure 17) which hold the retard gear PLATE COMPLETE. Lift up on the pinion end of the gear plate and mesh the teeth of the retarding sector with the teeth on the gear assembly. Tighten the two retard gear plate screws.

If the shutter is tripped at this stage of reassembly it will stay open somewhat longer than 1/10 second. Replace the CONTACT ESCAPEMENT WHEEL and pinion assembly (Figure 5) and fasten it with the retaining screw. Replace the CLUTCH ASSEMBLY and fasten it with the retaining screw. The top gear on the clutch assembly should only turn freely in a clockwise direction when the lower gear is held tight.

Replace the WINDING GEAR with pinion and spring assembly. Place the hooked end of the spring beneath the contact escapement wheel and against the clutch assembly stud.

Fit the detent SPRING AND ROLLER ASSEMBLY over the long mechanism plate SCREW (Figure 19). The roller held end of the spring should be next to the mechanism plate with the roller facing up. Place the detent spring WASHER (Figure 5) over the spring. Place the roller between two teeth of the escapement wheel and fasten the spring with the detent spring BUSHING. Do not exert too much pressure against the escapement wheel as the bushing is tightened.

Fit the contact lever COMPLETE (Figure 18) over the contact stud. The lever is slipped under the contact spring and lifted up until it can be slipped onto the stud. Replace the contact lever spring. The hooked end fits around the contact arm bushing and the long end rests against the shutter case. Replace the contact lever retaining screw.

CAUTION: The end of the contact lever assembly which rides against the TRIGGER LATCH (Figure 15) must be highly burnished. Care should be taken at all times against touching this surface during adjustments.

Set the shutter. Then release it by pushing on the trigger. At the same time retard the opening action of the shutter by placing one finger against the main drive lever. Allow the shutter to release slowly, at the same time observing whether the contact stud on the blade controller makes slight contact with the contact spring when the shutter blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.

Check the fall of the point on the contact lever as it falls between the teeth of the contact escapement wheel and pinion assembly. The roller on the end of the detent spring and roller assembly should be between two teeth of the escapement wheel at the same time as the contact arm. If it does not, the spring can be shortened or lengthened by pulling it forward or pushing it back. When the contact arm is between the teeth there should be a minimum of play in the escapement wheel. This adjustment will insure against the point of the contact resting on the top of the escapement wheel after the shutter has been set. If it did, the winding LEVER (Figure 14) would not lock into position when pulled down.

COVER COMPLETE AND ASSOCIATED PARTS

Replace the COVER COMPLETE (Figure 2), fitting the shaft on the winding gear with pinion and spring assembly into the hole in the winding gear pinion BRACKET (Figure 2). Fasten the cover with the two LONG and one SHORT COVER SCREWS.

Set the shutter and replace the trigger latch with the long bent end of the latch contacting the inner edge of the contact lever complete. Secure the latch to the trigger with the trigger latch BUTTON (Figure 15) and holding screw.

Replace the TRIGGER LATCH SPRING (Figure 2) by holding the hooked end of the spring halfway between the latch and the central opening on the mechanism plate, and fastening it with the trigger latch spring SCREW. Hook the end of the spring over the outer edge of the trigger latch. The latch should be burnished at the point of spring contact.

PARTS ON FRONT OF SHUTTER

Replace the winding lever with the sixth or seventh tooth from the left meshed with the winding gear with pinion and spring assembly. Place the winding gear spring in tension by giving two and one-half strokes on the winding lever, lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

CAUTION: In lifting the winding lever between strokes, be careful not to touch the trigger latch, as it will move out toward the case and touch the contact lever which in turn will release the tension on the winding gear spring.

Trip the shutter and with the point of a jeweler's screwdriver, lightly hold the winding lever down around the central collar on the cover complete at

a point near the trigger latch. As the shutter is tripped the end of the latch should fall into the slot on the cover plate. If it does not, add more tension to the trigger latch spring. The winding lever should contact the trigger latch, push the latch out of the slot in the cover plate and open the shutter blades. After the shutter blades have been tripped, the trigger latch should return to a position where the latch is resting on the ledge just above the small slot in the cover plate.

At this point the end of the contact lever complete should be firmly seated between the teeth of the contact escapement wheel. This will insure that when the shutter is again set and the winding lever is pulled down, it will stay down.

If the end of the contact lever is not seated in the escapement wheel, disconnect the trigger latch spring and lift up the trigger latch to allow free movement for the contact lever. With the point of a jeweler's screwdriver resting against the case, place the blade against the outer edge of the contact lever and push it very slightly towards the shutter blades. When the contact lever fits properly there should be a very small amount of play between the contact lever and the trigger latch.

Check for trigger contact. As the trigger latch is forced down, it will release the pointed end of the contact lever complete from the contact escapement wheel, but the contact point assemblies should not make contact. They should be as close as possible without touching.

After the trigger is pushed down, allow it to return to its proper position very slowly. If there should be too much tension on the trigger latch spring, it will tend to retard the action of the latch. This is also true if there is too much tension between the trigger latch and the contact lever. In a properly fitted contact arm and latch, play between the two should be at a minimum.

Place the flash retard PALLET ASSEMBLY (Figure 2) on the pallet assembly stud. Be sure that the pallet stud is tight on the cover. If any adjustment is made on the stud it should be anchored securely in position. Replace the speed control RING (Figure 14) on the shutter. Place the speed and diaphragm INDEX PLATE with synchronizer scale in position on the speed control ring. Replace the diaphragm pointer TIP and screw the diaphragm pointer stop screw. Replace the front and rear lens elements.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter very slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open before the winding lever opens them. If this occurs refer to the Trouble Chart.

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

F (short stroke) 3 — 5 milleseconds.
M (long stroke) 12 — 16 milleseconds.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
No Kodatron contact	The contact stud on the BLADE CONTROLLER WITH CONTACT STUD (Figure 9) is not touching the CONTACT SPRING (Figure 18).	Adjust the contact spring so that it touches the stud on the blade controller as the shutter blades are almost fully opened. It is possible to make this adjustment after removing the front lens elements. There should be no Kodatron contact when the shutter blades are held open by the blade arrestor button.
The winding lever does not hold when set	The clutch assembly is slipping.	Replace the clutch assembly.
	The contact lever may not be seated properly in the escapement wheel.	Adjust the arm of the contact lever where it rides on the trigger latch. If the arm is moved in slightly toward the latch, the point on the contact arm will lock more securely in the escapement wheel.

TROUBLE	CAUSE	REMEDY
	The teeth on the escapement wheel may be burred.	Replace the escapement wheel.
	The point of the contact arm may not be falling into the escapement wheel properly.	Adjust the detent spring so that when the point of the contact arm falls into the escapement wheel there is a minimum of movement in the gear and no danger of the point resting on a point of the gear.
Shutter speeds slow	Retard gears dirty.	Remove and clean the retard gears.
	Shutter blades binding.	Remove and clean, or replace the shutter blades.
	The MAIN DRIVE SPRING (Figure 17) has lost its tension.	Fit new main drive spring.
Shutter operates instantaneously on 'Bulb'	Tension is weak on the BULB LEVER SPRING (Figure 15).	See page 37.
	Lug on the side of the rectangular opening in the trigger is out of adjustment.	See page 37.
Shutter does not operate on 'TIME'	TIME LEVER ASSEMBLY (Figure 15) binding.	Refit time lever and add slight tension to the TIME LEVER SPRING (Figure 15).
Shutter will not set	The trigger latch is not returning to its proper position after the shutter has been released.	Check the tension on the TRIGGER SPRING (Figure 15). It may be necessary to add tension.
		The trigger latch may be bent and binding on the diaphragm index plate.
		The tension may be too great on the trigger latch.
		The tension between the contact lever assembly and the trigger latch may be too great. Be sure that the pointed end of the contact lever is not resting on a point of the detent gear.
	The contact lever is resting on a point of the escapement wheel.	Adjust the DETENT SPRING (Figure 5) so that the contact lever will fall between the teeth of the detent gear.
Shutter blades stay open	Split shutter blades.	Replace shutter blades.
	Loose studs on shutter blades.	Replace shutter blades.
	The blade controller latch loose on the MAIN DRIVE BUSHING and disk ASSEMBLY (Figure 16).	Remove the latch from the lever on the blade controller. Tighten the blade controller latch stud. Bend the straight end of the latch spring downward so it will hold the latch against the mechanism plate more securely.
Shutter blades rebound	Blade controller LATCH with stud assembly (Figure 16) does not fit properly.	See page 37.
Both flash settings are below the millesecond tolerances (Fast)	The tension is too great on the WINDING GEAR SPRING (Figure 5).	Relieve the tension slightly on the winding gear spring.

TROUBLE	CAUSE	REMEDY
Both flash settings are above the millesecond tolerances (slow)	There is not enough tension on the winding gear spring.	Place the winding gear under slightly greater tension. Care should be taken during this adjustment not to disturb the TRIGGER LATCH (Figure 15).
	The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE (Figure 14).	The index plate will be marked at the binding point. The plate can be filed slightly to allow clearance. The inner surfaces of the winding lever should be burnished and the cover checked for burrs. Be sure the winding lever is not bent.
The F (short stroke) is within the millesecond tolerances	The flash retard PALLET ASSEMBLY (Figure 2), is not meshing properly with the winding lever.	With special tool No. 657 turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. After making this adjustment make certain that the stud is tight on the cover.
Constant flash short	The contact POINT ASSEMBLY (Figure 18) has become disassembled.	Replace the contact point assembly.
	The CONTACT SPRING (Figure 18) may be bent and touching either the contact lever or the cover.	Reform the contact spring.
	Cracked contact insulating block on the contact lever, or the insulating block retaining screw is loose.	Replace the contact insulating block, or tighten the retaining screw.
	The contact strip insulation may be scraped off.	Replace the damaged strip.
	The end of the contact spring may be touching the cover or the contact lever.	Readjust the contact spring.
Both flash settings are extremely fast or below the millesecond tolerances	The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon.	Add more tension to the trigger latch spring.
	The end of the trigger latch is bent back towards the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades.	Reform the end of the trigger latch by bending it slightly towards the winding gear.
		After the shutter has been assembled, it can be checked to see if the shutter blades will open before the winding lever opens them. 1. Set the shutter. 2. Set the winding lever. 3. Holding the winding lever down, release the shutter. The shutter blades should not open while the winding lever is down.

FLASH KODAMATIC SHUTTER

FOR THE KODAK MONITOR SIX-20 CAMERA

DISASSEMBLY

PARTS ON FRONT OF SHUTTER

Remove the front and rear lens elements and lift off the speed and diaphragm INDEX PLATE with synchronizer scale (Figure 22) and the speed control RING.

CAUTION: If a minor repair is to be made and the shutter does not have to be disassembled below the COVER COMPLETE (Figure 2), care should be taken when removing the speed control ring, not to disturb the winding LEVER (Figure 22). If the winding lever is moved, the flash timing will have to be adjusted.

Disengage and lift off the winding lever.

COVER COMPLETE AND ASSOCIATED PARTS

Unhook and remove the TRIGGER LATCH SPRING (Figure 2) by removing the trigger latch SPRING SCREW.

If it is necessary to replace the TRIGGER LATCH (Figure 24), remove the trigger latch BUTTON. Lift off the trigger latch.

If it is not necessary to replace the trigger latch lift up on the loose end of the latch sufficient to clear the bulb lever assembly and the cover complete. Move the loose end of the latch until all of the latch is clear of the case.

Lift out the flash retard PALLET ASSEMBLY (Figure 2). Remove the cover complete by removing the two LONG and one SHORT COVER SCREWS.

PARTS ON MECHANISM PLATE

Lift out the WINDING GEAR with pinion and spring assembly (Figure 5). Remove the retarding SECTOR SCREW (Figure 17) and lift off the retarding SECTOR WITH STUD and the retarding SECTOR SPRING. This is more easily accomplished with the shutter in a set position.

Trip the shutter, and unhook the long end of the blade controller LATCH SPRING (Figure 23). Remove the main drive SCREW.

Unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD (Figure 27). Remove the setting lever cover PLATE (Figure 22) by removing the two retaining screws. Set the shutter and at the same time move the latched end of the blade controller LATCH with stud assembly (Figure 23) toward the shutter blades. Then trip the shutter and lift off the MAIN DRIVE BUSHING and disk ASSEMBLY. Remove the blade controller latch.

Open the shutter blades by pushing the BLADE CONTROLLER LEVER (Figure 27). Then open the diaphragm wings.

Remove the trigger SCREW (Figure 24), the TRIGGER SPRING, and the trigger WASHER.

Lift out the TRIGGER, two SPACING WASHERS, the BULB LEVER ASSEMBLY and the BULB LEVER SPRING.

Remove the CLUTCH ASSEMBLY (Figure 5) by removing the retaining screw. Remove the CONTACT ESCAPEMENT WHEEL and pinion assembly by removing the holding screw.

Remove the blade controller LATCH SPRING BUSHING (Figure 23) and the blade controller latch spring.

RETARD GEAR TRAIN

Remove the two retard GEAR PLATE SCREWS (Figure 17) and lift off the retard gear PLATE COMPLETE.

Remove the remainder of the gear train as follows:

1. Retard GEAR WITH NO. 2 PINION assembly.

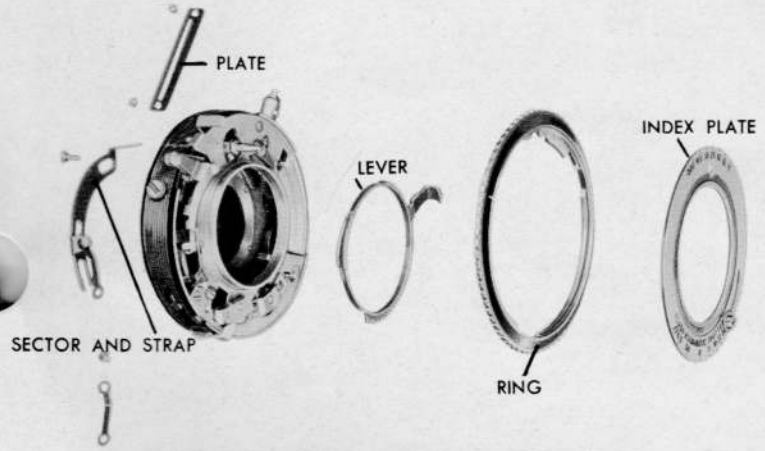


Figure 22

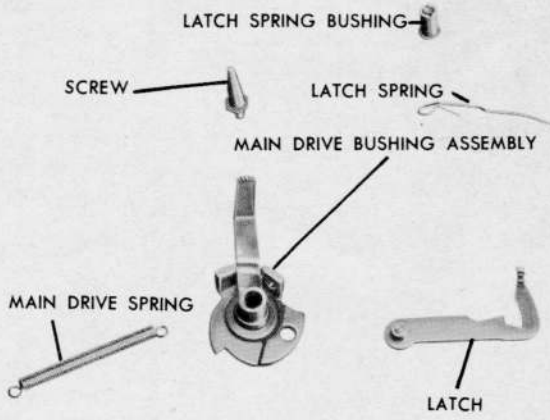


Figure 23

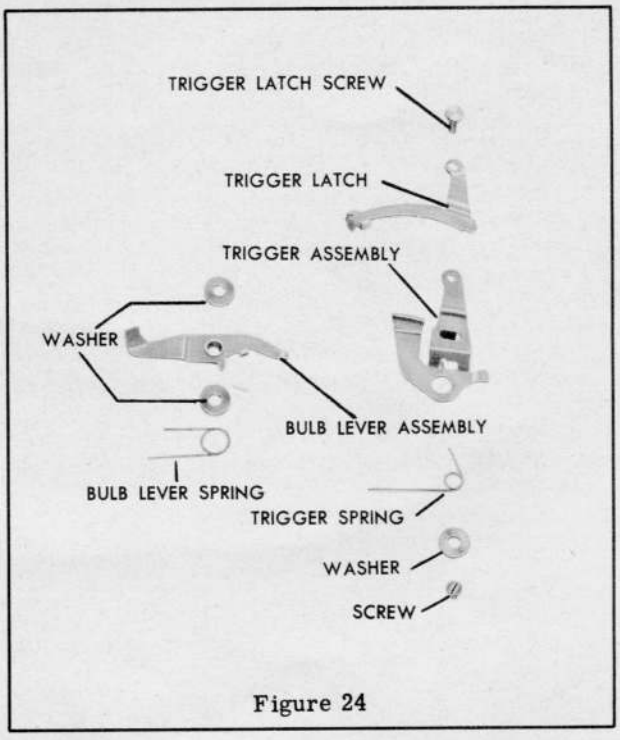


Figure 24

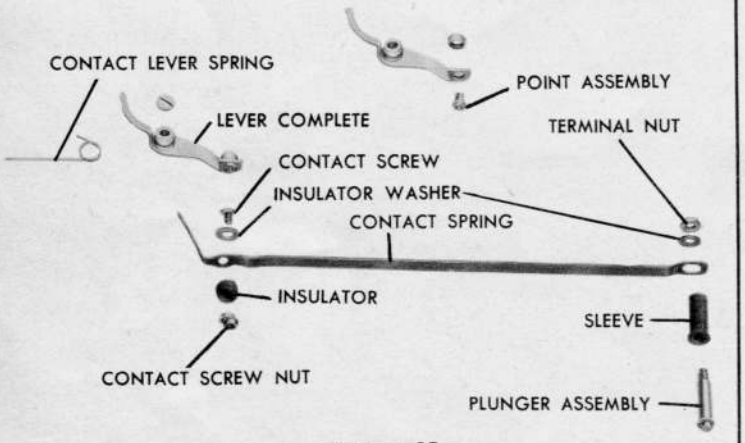


Figure 25

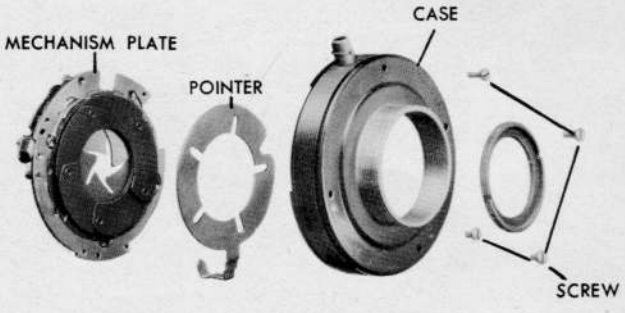


Figure 26

2. ESCAPEMENT WHEEL with No. 3 pinion assembly.

3. PALLET ASSEMBLY.

4. PALLET BRACKET assembly and the PALLET BRACKET SPRING.

NOTE: If the retard gears are dirty causing the low speeds to be too slow, clean all the parts of the retard gear train in carbon tetrachloride and dry them thoroughly.

WARNING: Carbon tetrachloride is a volatile solvent. Use it with adequate ventilation. Avoid frequent or prolonged breathing of the vapors.

MECHANISM PLATE AND CONTACT POINTS

With tool No. 503J, remove the TERMINAL NUT (Figure 25) on the end of the PLUNGER ASSEMBLY. Remove the case INSULATOR WASHER, the plunger assembly and the terminal body insulating SLEEVE. On the contact end of the CONTACT SPRING, remove the CONTACT SCREW NUT using tool No. 503L. Remove the CONTACT SCREW, the case INSULATOR WASHER and the case INSULATOR.

Remove the contact LEVER COMPLETE and the CONTACT LEVER SPRING by removing the retaining screw. Remove the detent SPRING and ROLLER ASSEMBLY (Figure 5) by removing the detent spring BUSHING and the detent spring WASHER.

Turn the shutter over and remove the shutter release SECTOR AND STRAP assembly (Figure 22) by removing the two short mechanism plate holding screws. Remove the two remaining mechanism plate screws.

Lift out the MECHANISM PLATE complete (Figure 9), and the diaphragm retainer PLATE WITH WINGS ASSEMBLY. Remove the diaphragm POINTER (Figure 26). Remove the five diaphragm retainer plate SCREWS (Figure 9) and lift off the retainer plate. Lift out the six SHUTTER BLADES. Remove the BLADE CONTROLLER with contact stud.

REPAIR

BLADE CONTROLLER LATCH (See figure 10)

If the shutter blades rebound and leave a small opening when closing, the blade controller LATCH with stud assembly (Figure 23) is not properly holding the BLADE CONTROLLER LEVER (Figure 27).

Reshape the latch at point A (Figure 10) to hold the lever of the blade controller tightly against the mechanism plate when the blades are closed. Be sure the opening in the latch is not closed too far. The lever on the blade controller should fit freely into the end of the groove at point B. If the lever binds at this point, the edge of the latch should be filed slightly at point C.

BULB LEVER

If the shutter works instantaneously when set on B (bulb), the tension on the BULB LEVER SPRING

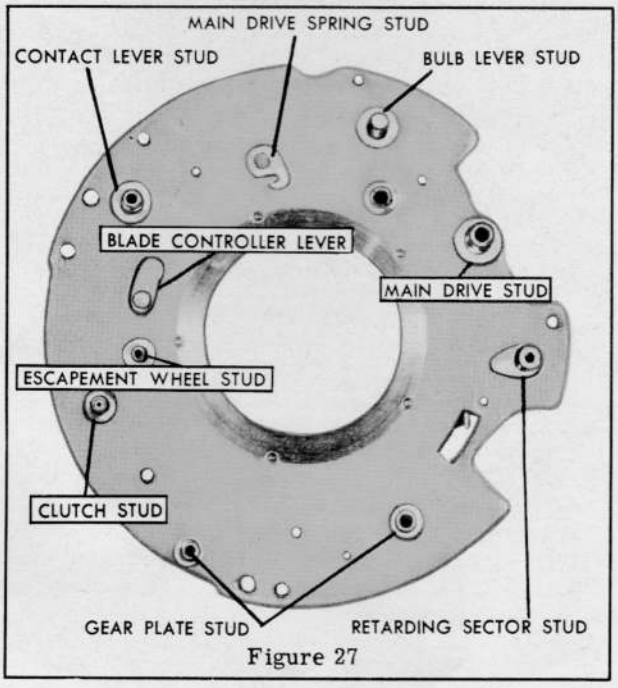


Figure 27

(Figure 24) may be weak. Increase the tension on the spring by bending the long bent end toward the case. If necessary replace the spring.

Failure of the shutter to operate properly on B may also be caused by improper adjustment of the lug on the side of the trigger. If the lug is bent too far toward the MAIN DRIVE BUSHING with disk ASSEMBLY (Figure 23), it will prevent the end of the bulb lever assembly from stopping the disk on the main drive bushing and disk assembly, because the bulb lever assembly will not be allowed to move far enough in toward the disk. To correct this trouble, bend the lug out slightly so that it allows full motion of the bulb lever assembly toward the disk.

ADJUSTING SHUTTER SPEEDS

Shutter testing equipment is necessary for the precise adjustment of shutter speeds. If no special equipment is available, time the speeds as well as possible with a shutter known to be in good adjustment.

1. If the 1/10 second is slow and all the speeds are slow, the main drive spring has lost some of its tension and should be replaced. Also check to make sure that the shutter blades are not binding.

2. If the 1/10 second and the remaining low speeds are slow, but the high speeds appear to be correct, the retard gear train is probably dirty and slowing up the speeds on which it is engaged.

3. If the 1/10 second and all the low speeds are fast, the retarding SECTOR WITH STUD (Figure 17) may be incorrectly meshed so that a full motion of the retard gear train is not obtained.

Uneven shutter speeds, (for example, 25, 50, and 200 are correct but 100 is fast or slow), should be corrected only if special shutter testing equipment is available. To adjust a speed, file or swedge the speed control ring at the proper point. Filing slows the speed while swedging speeds it up.

REASSEMBLY

RETARD GEAR TRAIN

Place the PALLET BRACKET SPRING (Figure 17) inside the PALLET BRACKET assembly with the long end of the spring at the top and facing the edge of the MECHANISM PLATE complete (Figure 9) and place them over the pallet bracket stud. Fit the PALLET ASSEMBLY (Figure 17) over the stud on the pallet bracket assembly. Replace the ESCAPEMENT WHEEL with No. 3 pinion assembly, and the retard GEAR WITH NO. 2 PINION assembly.

Replace the retard gear PLATE COMPLETE and fasten it with the two retard GEAR PLATE SCREWS. Place the long end of the pallet bracket spring against the protruding lip on the retard gear plate.

MECHANISM PLATE AND CONTACT POINTS

Replace the blade controller, fitting the BLADE CONTROLLER LEVER (Figure 27) through the small opening in the mechanism plate.

Before replacing the shutter blades, clean them with carbon tetrachloride. Hold the blades carefully to avoid bending, and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.

With the blade controller lever turned as far as possible toward the pallet bracket assembly, replace the BLADE WITH DOUBLE blade STUD assembly (Figure 9) with the hole in the blade over the stud on the back of mechanism plate near the blade controller lever. The stud on the blade must be turned up, and the bushing on the other side of the blade must fit into the cutout slot on the inner edge of the blade controller. Proceeding counterclockwise replace a BLADE WITH STUD assembly allowing the wide end of each blade to overlap the narrow end of the preceding blade.

Place the remaining BLADE over the blade with double blade stud assembly, fitting one hole in the blade over the stud on the mechanism plate and the other hole over the stud on the blade with double blade stud assembly. When this has been done the back of the mechanism plate should appear as shown in figure 12.

Replace the diaphragm retainer PLATE WITH WINGS ASSEMBLY by lining up the cutout slot in the outer edge of the retainer plate with the stud on the pallet bracket assembly. Then drop the retainer plate gently on the mechanism plate. Replace the five diaphragm retainer plate SCREWS.

With the top of the mechanism plate facing you, close the shutter blades. The very tip of the top shutter blade should be bent up very slightly with the side of a pair of tweezers. Turn the mechanism plate over and bend up the tip of the bottom shutter blade. This is done to prevent the shutter blade from splitting. Care should be taken not to bend the blades too much or they will bind when fully opened.

Open the shutter blades. Close the diaphragm wings and then run the side of a screwdriver blade around in the central opening in the mechanism plate. This will open up the diaphragm wings uniformly to the maximum aperture.

Insert the DIAPHRAGM POINTER (Figure 26) in the largest slot in the side of the shutter case with

the pointer facing up. Move the pointer as close as possible to the retard gear train.

Insert the threaded end of the PLUNGER ASSEMBLY (Figure 25) in the collar end of the terminal body insulating SLEEVE. Then insert the assembled parts in the terminal body. Position the end of the contact spring over the opening in the shutter case and push the threaded end of the plunger assembly through the opening in the spring. Place the case INSULATOR WASHER on the end of the contact spring over the opening in the shutter case and push the threaded end of the plunger assembly through the opening in the spring. Place the case INSULATOR WASHER on the end of the plunger assembly and fasten the plunger with the TERMINAL NUT.

Insert the case INSULATOR in the hole in the side of the case near the stud on the blade controller with the collar end of the insulator facing out. Replace the case INSULATOR WASHER over the opening on the side of the shutter case. Position the contact end of the CONTACT SPRING against the washer and insert the CONTACT SCREW in the opening in the spring. Fasten the screw with the contact screw nut, using tool No. 503L while holding the screw in position with tool No. 262.

NOTE: Whenever a contact screw and nut are reassembled to a shutter case, it is necessary that an insulating seal be applied to the contact screw nut to prevent moisture or foreign objects from grounding the flash circuit to the shutter case. Black Glyptol (quick drying) is recommended as a good insulating material. This must be applied to the contact nut carefully to insure a continuous coating.

Hold the mechanism plate with the retard gear train up and line up the screw hole on the edge of the mechanism plate, near the retarding sector, with the corresponding hole in the case. Slip the mechanism plate into the case under the contact end of the contact spring. Hold the mechanism plate in position and replace the long mechanism plate SCREW and one short mechanism plate SCREW.

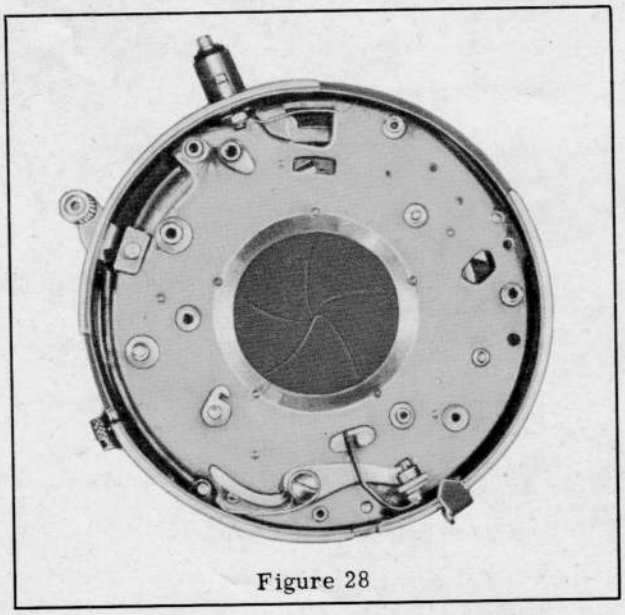


Figure 28

See that the circular projections on the ends of the diaphragm wings are in position in the slots in the diaphragm pointer. If they are not, push each one into position. The shutter should appear as shown in Figure 28.

Attach the shutter release SECTOR AND STRAP assembly (Figure 22) to the back of the shutter case with the two remaining short mechanism plate screws.

PARTS ON MECHANISM PLATE

Place the blade controller LATCH SPRING (Figure 23) with the short end of the spring against the retarding sector stud and the spring loop over the threaded end of the long mechanism plate screw. Screw the blade controller LATCH SPRING BUSHING loosely on the screw. Hold the long end of the spring tightly against the inside wall of the case and tighten the bushing so that it holds the spring in place with tension toward the case.

With the BULB LEVER SPRING (Figure 24) underneath, hold the TRIGGER with the oval hole up and insert the BULB LEVER ASSEMBLY in the opening on the trigger. Then place the two spacing washers over the top of the bulb lever assembly. Then grasp all four parts by inserting one prong of a pair of tweezers down through the center of the holes. With the longer end of the bulb lever spring turned in a clockwise direction and the shorter end resting against the lug on the bulb lever, guide the parts down over the BULB LEVER STUD (Figure 27). The long end of the spring should rest against the shutter case.

Place the trigger WASHER (Figure 24) over the round hole in the base of the trigger. Hold the TRIGGER SPRING over the washer with the short end pointing toward the contact stud on the blade controller. Replace the trigger SCREW. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD (Figure 27) and rest it against the stud.

With the MAIN DRIVE SPRING (Figure 23) hooked in the small hole in the disk on the MAIN DRIVE BUSHING and disk ASSEMBLY, insert the stud on the latch in the small opening on the disk. Hold the assembly with the latch pointing toward the central opening in the mechanism plate, and fit the bushing down over the MAIN DRIVE STUD (Figure 27).

Close the shutter blades. Push the latch toward the lever on the blade controller, and set the shutter by pushing the lever on the main drive bushing clockwise. The cutout portion of the latch will come to rest around the lever on the blade controller. Lift up the long end of the blade controller LATCH SPRING (Figure 23) and place it inside the vertical lug on the tip of the latch. Replace the main drive screw. Trip the shutter. Attach the main drive spring to the main drive spring stud.

Set the shutter and with the long end of the retarding SECTOR SPRING (Figure 17) at the top replace the retarding SECTOR WITH STUD together with the retarding sector spring on the RETARDING SECTOR STUD (Figure 27). Fasten both parts with

the retarding SECTOR SCREW (Figure 17). Lift up the long end of the retarding sector spring and place it against the inner side of the blade controller LATCH SPRING BUSHING (Figure 23).

Loosen slightly the two retard GEAR PLATE SCREWS (Figure 17) which hold the retard gear PLATE COMPLETE. Lift up on the pinion end of the gear plate and mesh the teeth of the retarding sector with the teeth of the gear assembly. Tighten the two retard gear plate screws.

If the shutter is tripped at this stage of reassembly it will stay open somewhat longer than 1/10 second.

Replace the CONTACT ESCAPEMENT WHEEL and pinion assembly (Figure 5) and fasten it with the retaining screw. Replace the CLUTCH ASSEMBLY and fasten it with the retaining screw. The top gear on the clutch assembly should only turn freely in a clockwise direction when the lower gear is held tight.

Replace the WINDING GEAR with pinion and spring assembly. Place the spring beneath the contact escapement wheel and pinion assembly, and against the stud of the clutch assembly.

Fit the detent spring and roller assembly over the mechanism plate SCREW (Figure 26). The roller held end of the spring should be next to the mechanism plate with the roller facing up. Place the detent spring WASHER (Figure 5) over the spring. Place the roller between the two teeth of the escapement wheel and fasten the spring with the detent spring BUSHING. Do not exert too much pressure against the escapement wheel as the bushing is tightened.

Fit the contact LEVER COMPLETE (Figure 25) over the contact stud. The lever is slipped under the contact spring and lifted up until it can be slipped over the contact stud. Replace the contact LEVER SPRING. The hooked end fits around the contact arm bushing and the long end rests against the shutter case. Replace the contact lever retaining screw.

> CAUTION: The end of the contact lever assembly which rides against the TRIGGER LATCH (Figure 24) must be highly burnished. Care should be taken at all times against touching this surface during adjustments.

Set the shutter. Then release it by pushing on the trigger. At the same time retard the opening action of the shutter by placing one finger against the main drive lever. Allow the shutter to release slowly at the same time observing whether the contact stud on the blade controller makes slight contact with the contact spring when the blades are fully open. If the spring does not touch the stud, bend the and of the spring toward the stud.

Check the fall of the point on the contact lever as it falls between the teeth of the CONTACT ESCAPEMENT WHEEL and pinion assembly (Figure 5). The roller on the end of the detent spring and roller assembly should be between the teeth of the escapement wheel at the same time as the contact arm. If it is not, the spring can be shortened or lengthened by pulling it forward or pushing it back. When the contact arm falls between the teeth there should be a minimum of play in the escapement wheel. This adjustment will insure against the point of the contact resting on the top of the escapement wheel after the shutter has been set. If it did, the winding LEVER (Figure 22) would not lock into position when pulled down.

COVER COMPLETE AND ASSOCIATED PARTS

Replace the COVER COMPLETE (Figure 2) fitting the shaft on the WINDING GEAR with pinion and SPRING ASSEMBLY (Figure 5) into the hole in the winding gear pinion BRACKET (Figure 2). Fasten the cover with the two LONG and one SHORT COVER SCREWS.

Set the shutter and replace the trigger latch with the long bent end of the latch contacting the inner edge of the contact lever complete.

Replace the TRIGGER LATCH SPRING by holding the hooked end of the spring approximately halfway between the latch and the central opening on the mechanism plate, and fastening it with the trigger latch SPRING SCREW. Hook the end of the spring over the outer edge of the trigger latch. The latch should be burnished at the point of spring contact.

PARTS ON FRONT OF SHUTTER

Replace the winding LEVER (Figure 22) with the sixth or seventh tooth from the left meshed with the winding gear with pinion and spring assembly. Place the winding gear spring in tension by giving two and one-half strokes on the winding lever, lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

> CAUTION: In lifting the winding lever between strokes, be careful not to touch the trigger latch because it will move out toward the shutter case and touch the contact lever complete which in turn will release the tension on the winding gear spring.

Trip the shutter and with the point of a jeweler's screwdriver, lightly hold the winding lever down around the central collar on the cover complete at a point near the trigger latch. As the shutter is tripped the end of the latch should fall into the slot on the cover plate. If it does not, add more tension on the trigger latch spring. The winding lever should contact the trigger latch, push the latch out of the slot in the cover plate and open the shutter blades. After the shutter blades have been tripped, the trigger latch should return to a position where the latch is resting on the ledge just above the small slot in the cover plate.

At this point the end of the contact lever complete should be firmly seated between the teeth of the contact escapement wheel. This will insure that when the shutter is again set and the winding lever is pulled down, it will stay down.

If the end of the contact lever is not seated in the escapement wheel, disconnect the trigger latch spring and lift up the trigger latch to allow free movement for the contact lever. With the point of a jeweler's screwdriver resting against the case, place the blade against the outer edge of the contact

lever and push it very slightly towards the shutter blades. When the contact lever fits properly there should be a very small amount of play between the contact lever and the trigger latch.

Check for trigger contact. As the trigger latch is forced down, it will release the pointed end of the contact lever complete from the contact escapement wheel, but the contact point assemblies should not make contact. They should be as close as possible without making contact.

After the trigger is pushed down, allow it to return to its proper position very slowly. If there should be too much tension on the trigger latch spring, it will tend to retard the action of the latch. This is also true if there is too much tension between the trigger latch and the contact lever. In a properly fitted contact arm and latch, play between the two should be at a minimum.

Place the flash retard PALLET ASSEMBLY (Figure 2) on the pallet assembly stud. Be sure that the pallet stud is tight on the cover. If any adjustment is made on the stud it should be anchored securely in position. Replace the setting lever cover PLATE (Figure 22) and secure it in place with the two retaining screws. Place the speed and control RING on the shutter. Place the speed and diaphragm INDEX PLATE with synchronizer scale in position on the speed control ring and secure it in place with the front lens element. Replace the rear lens element.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter very slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open before the winding lever opens them. If this occurs refer to the Trouble Chart.

Check the operation of the winding lever safety latch. When the shutter is not set the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

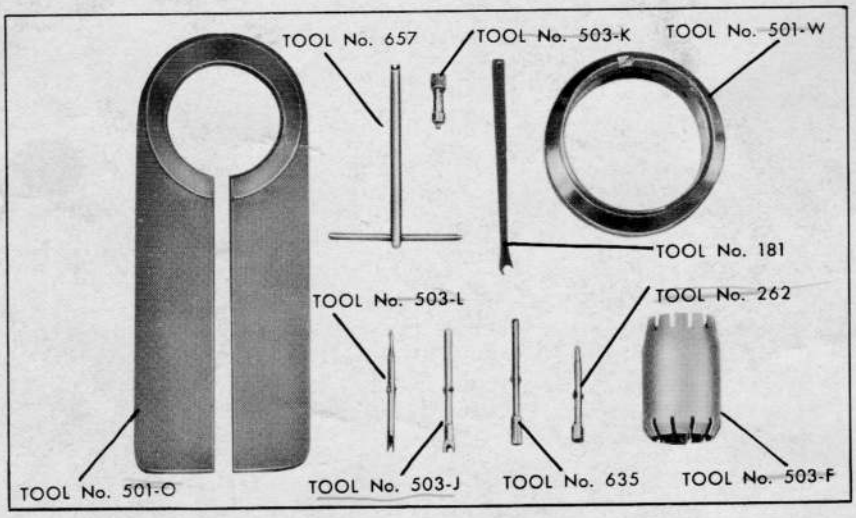
F (short stroke) 3 — 5 milleseconds.
M (long stroke) 12 — 16 milleseconds.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
No Kodatron contact	The contact stud on the BLADE CONTROLLER with CONTACT STUD (Figure 9) is touching the CONTACT SPRING (Figure 25).	Adjust the contact spring so that it touches the stud on the blade controller as the shutter blades are almost fully opened. It is possible to make this adjustment after removing the front lens elements.
The winding lever does not hold when set	The clutch assembly is slipping.	Replace the clutch assembly.
	The contact lever may not be seated properly in the escapement wheel.	Adjust the arm of the contact lever where it rides on the trigger latch. If the arm is moved in slightly toward the latch, the point on the contact arm will lock more securely in the escapement wheel.
	The teeth on the escapement wheel may be burred.	
	The point of the contact arm may not be falling into the escapement wheel properly.	Adjust the detent spring so that when the point of the contact arm falls into the escapement wheel there is a minimum of movement in the gear and no danger of the point resting on a point of the gear.

TROUBLE	CAUSE	REMEDY
Shutter speeds slow	Retard gears dirty.	Remove and clean the retard gears.
	The MAIN DRIVE SPRING (Figure 23) weak.	Replace the main drive spring.
	Shutter blades binding.	Remove and clean, or replace the shutter blades.
Shutter operates instantaneously on BULB	Tension is weak on the BULB LEVER SPRING (Figure 24).	See page 44.
	Lug on the side of the rectangular opening in the trigger is out of adjustment.	See page 44-45.
Unable to set the shutter	The trigger latch is not returning to its proper position after the shutter has been released.	Check the tension on the TRIGGER SPRING (Figure 24). It may be necessary to add tension.
		The trigger latch may be bent and binding on the diaphragm index plate.
		The tension may be too great on the trigger latch.
		The tension between the contact lever assembly and the trigger latch may be too great. Be sure that the pointed end of the contact lever is not resting on a point of the detent gear.
	The contact lever is resting on a point of the escapement wheel.	Adjust the detent spring so that the contact lever will fall between the teeth of the detent gear.
Shutter blades stay open	Split shutter blades.	Replace shutter blades.
	Loose studs on shutter blades.	Replace shutter blades.
	The BLADE CONTROLLER LATCH WITH STUD ASSEMBLY (Figure 23) loose on the MAIN DRIVE BUSHING and disk ASSEMBLY.	Remove the latch from the lever on the blade controller.
		Tighten the blade controller latch stud. Bend the straight end of the latch spring down so it will hold the latch against the mechanism plate more securely.
Shutter blades rebound	Blade controller latch does not fit properly.	See page 44.
Both flash settings are below the millesecond tolerances (fast)	The tension is too great on the WINDING GEAR SPRING (Figure 5).	Relieve the tension slightly on the winding gear spring.
Both flash settings are above the millesecond tolerances (slow)	There is not enough tension on the winding gear spring.	Place the winding gear under slightly greater tension. Care should be taken during this adjustment not to disturb the TRIGGER LATCH (Figure 24).
	The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE (Figure 22).	The index plate will be marked at the binding point. The plate can be filed slightly to allow clearance. The inner surfaces of the winding lever should be burnished and the cover checked for burrs. Be sure the winding lever is not bent.

TROUBLE	CAUSE	REMEDY
The F (short stroke) is within the millesecond tolerances but the M (long stroke) is fast	The flash retard PALLET ASSEMBLY (Figure 2), is not meshing properly with the winding lever.	With special tool No. 657 turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. After making this adjustment make certain that the stud is tight on the cover.
Constant flash short	The contact POINT ASSEMBLY (Figure 25) has become disassembled.	Replace the contact point assembly.
	The CONTACT SPRING (Figure 24) may be bent and touching either the contact lever or the cover.	Reform the contact spring.
Both flash settings are extremely fast or below the millesecond tolerances	The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon.	Add more tension to the trigger latch spring.
	The end of the trigger latch is bent back towards the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades.	Reform the end of the trigger latch by bending it slightly towards the winding gear.



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